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# WORLD CROPS

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Vol. 6. No. 4 — APRIL 1954


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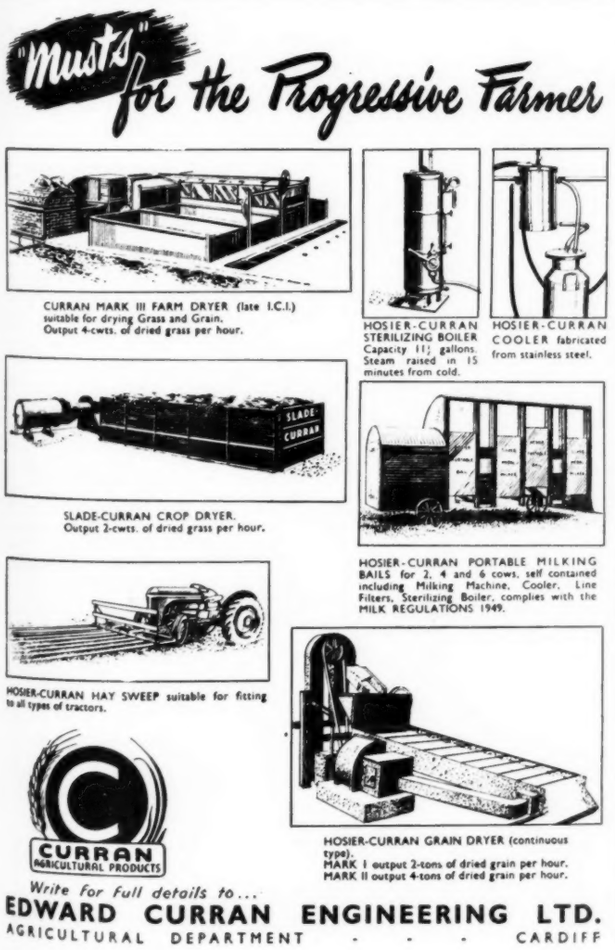
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# Editorial Comment

## Cocoa prices and production

A FEATURE of the market for tropical agricultural commodities recently has been the unprecedented rise in the prices for raw cocoa. For example, on the London futures market in January last a new peak of 402s. per cwt. was recorded. When one contrasts this with the pre-war position between the years 1931 and 1939, when the price of cocoa was well below the parity for other food crops in a period which covered the greatest economic depression in the world's commercial history, the comparison is startling.

FAO have recently produced a memorandum on the economic position of cocoa for their committee on commodity problems, in which the problem of markets for cocoa is discussed. From this it appears that of recent years there has been a complete reversal of trends in the cocoa market. In the past cocoa production has steadily increased and the tendency has been for the increases to keep rather ahead of consumption. World production and consumption have both increased enormously, the former having risen from an average of 236,000 tons in 1910 to 730,000 tons in 1938. Consumption also increased *pari passu*, but always was slightly behind production, the net result being that throughout this period generally prices were low. In the view of FAO, however, the rise in consumption was only in a minor degree due to the low level of cocoa prices, the main factors being growing populations, increasing real incomes and the development of the popular taste for chocolate confectionery.

During and after the war period cocoa production has not shown the same tendency to increase, although the factors which induced increased consumption in the past have continued to be operative; the result has been that demand has considerably outstripped production and prices have soared to the present record levels.

The principal reason for the arrest of the rise of production is undoubtedly the great increase in the prevalence of disease on cocoa both in the Western Hemisphere and also in West Africa, where the major increase in production has taken place, swollen shoot disease, the attacks of capsid bugs and black pod disease being the principal factors in West Africa, and witches broom disease, monilia pod rot and black pod in the Western Hemisphere.

Contrary to opinion in some quarters, swollen shoot disease must on balance be regarded still as the major factor; it is true that its spread can be held in check by rigorous cutting out of infected trees, but at present the balance of production is only being maintained by new planting, combined with a cutting out campaign which is still far from being 100% efficient, although it represents a nearer approach to efficiency than has previously been found possible.

To meet the increasing potential demand much attention is being paid to possible production in countries where the crop is not yet widely grown, as well as to extensions of the area cultivated in the present countries of production. FAO considers that the possibilities of increased production are almost unlimited and gives as a guess estimate of the total area in the world capable of producing cocoa the figure of 9.1 million hectares.

It is, however, to be borne in mind that the only safe and certain way of ensuring that in due time the supply and demand position for cocoa is stabilised is by ensuring that production is carried on by methods which ensure the application of rational cultivation, including steps to detect and control disease, for only in that way can some degree of immunity from the difficulties which have beset the industry in the past be secured.

## Feeding rubber trees

THE Ceylon Rubber Research Institute has recently emphasised the importance of fertilisers for newly planted rubber trees. If in former days rubber trees could be planted in fairly rich soils, this has become less and less possible today. The disposal of old trees as firewood has been economically attractive, but it causes considerable loss of plant food, while previous cropping has removed large quantities of nitrogen, phosphate, and potash from soil reserves. It is believed that disappointing results from post-war replantings have been due to soil impoverishment and not to any fundamental weakness in new stock. The introduction of modern foliar analysis to check the nutrient status of growing trees has revealed numerous cases of potash deficiency and some of nitrogen deficiency; the significance of phosphates for rubber production is now widely appreciated throughout the Far East, and it is probable that more consistent attention has been paid to this plant-food than to any others.

As rain is unpredictable and intensely heavy when it occurs, there is always the risk of nutrient loss soon after an application. It is accordingly necessary to split an annual fertiliser requirement into at least four dressings per year, or even into eight monthly dressings from March to October.

The practice of giving heavy dressings once a year can be largely nullified so far as nitrogen and potash are concerned by violent rain. Hitherto, mixtures low in potash have been recommended by the Institute but it is admitted that their formulation is a ' hang-over ' from the war and early post-war fertiliser allocations. An N-P-K mixture in 4:6:5 ratio is now recommended instead.

In 1947, a third of Ceylon's rubber acreage was described as uneconomic by a commision of enquiry, and a subsidised plan to replant about one quarter of the total acreage was initiated. At the same time the gradual post-war revival of other world centres for natural rubber exposed Ceylon's output to new competition. The future of Ceylon's rubber industry depends greatly upon the performance of her rehabilitated plantations, and this in turn would seem to depend upon adequate and properly balanced fertiliser supply.

## Cigarettes and cancer

THE recent announcement by the Minister of Health in Britain that cigarette smoking can be regarded as having a definite connection with the occurrence of cancer of the lung has created a considerable sensation. The Minister was guarded in his statement and was careful to refrain from saying that smoking must be regarded as the cause of the disease; indeed, this was obviously necessary, since cases of this dread complaint occurring in habitual non-smokers are by no means rare. On the other hand, the enormous increase in the incidence of the disease during the past 40 years or so, and especially during the last two decades, coupled as it is with the great extension of the habit of cigarette smoking by both sexes, and supported by statistics, certainly lends substantial support to the claim that there is some unspecified connection between the two.

At present no particular constituent of tobacco smoke is suggested as the possible cause. It is, of course, true that a number of organic compounds are definitely recognised as being carcinogenetic, and it seems by no means beyond the bounds of possibility that one or more compounds in this class may occur in the products of the destructive distillation of tobacco, for that is what smoking really is, but on this an open mind must be preserved until the matter is clarified by further research. It is not altogether surprising, however, that among the first reactions to the announcement was a fall in the market value in the shares of some of the leading tobacco manufacturers. Another reaction was the spontaneous donation of the large sum of £250,000 by tobacco manufacturers in the United Kingdom to further research into cancer. Already very large resources are available for this purpose, but this donation should prove a valuable addition thereto and may be expected to bring the solution of the great mystery of the causation of this disease a step nearer.

It is as yet far too early to say what effect this announcement will have on world production and consumption of tobacco. That it is bound to have some effect, unless it can be shown ultimately that the fears entertained are groundless, seems obvious. On the other hand, the attraction of tobacco for its devotees the world over is so very strong that it seems doubtful whether fear of an imperfectly understood risk, which has only become evident after centuries of experience, will suffice to wean more hardened smokers from their allegiance, especially when in Britain they have successfully withstood the savage taxation inflicted on the product during the war, which has not so far been alleviated. It is hardly necessary to recall that of the 3s. 7d. which the average smoker pays for his 20 cigarettes in Britain nearly three-quarters is taxation, the cost of the tobacco, packing, distribution and management, plus the management's profit, having to be covered by the remaining quarter.

World production of tobacco has increased considerably since before the war. Recent figures published by the Commonwealth Economic Committee show that between 1937 and 1951 total world production increased by 1,100 million lb, the total production being for 1951 6,570 million lb. Of this, 2,250 million were produced in the U.S.A. Production in the British Commonwealth has fallen somewhat below pre-war mainly because in Pakistan and India production has dropped by some 300 million lb. since 1939; on the other hand, production in some other Commonwealth countries, notably Canada, Southern Rhodesia, the Union of South Africa, Northern Rhodesia and Nyasaland, has considerably increased.

Any diminution in tobacco production in these countries in consequence of fears engendered by the foregoing pronouncement on the effect of smoking on health might be expected, therefore, to have somewhat severe repercussions on their economies, while, should there be a marked falling off in tobacco consumption in Great Britain, it would almost certainly constitute a grave problem for the Chancellor of the Exchequer and the officials of H.M. Treasury by reason of the loss of revenue involved.

## British potash

ALTHOUGH it is certain that potash sufficient for all British needs for many years ahead exists in the Whitby area of Yorkshire, it seems increasingly doubtful whether mining will actually take place. The difficulty that has been clear from the outset has apparently not been rendered less formidable by continued investigations. That, of course, is the fact that these rich deposits lie at a depth of almost a mile. German potash is mined at a depth of only 1,500 ft. According to a recent speech made by the local Member of Parliament, the development of Yorkshire's potash would require an expenditure of between £7,000,000 and £9,000,000 and the work involved would take from seven to nine years. The interested companies are hardly likely to invest such huge sums; the Government is said to be reluctant to offer financial help. On the other hand, it was reported late last year that the well-known mining company, Powell Duffryn Ltd., had been consulted for advice and this at least seemed an indication that the project had not been abandoned.

There is an interesting parallel on the other side of the Atlantic—in Saskatchewan, Canada. There potash deposits are known to exist at a depth of 3,000 ft. The mining problem is 75 per cent. as difficult as that of the Yorkshire deposits. Nevertheless, the Potash Co. of America has made an agreement with the Saskatchewan Government to spend several hundred thousand dollars on exploration and development in the next three years. The cases are not dissimilar in terms of horizontal as well as vertical distances; just as Europe has plenty of readily reachable potash and Britain has not, so the United States is abundantly, supplied with potash and Canada is not. The economic problem for both these deep-lying deposits is the same—how far can the production costs of deep-mining be set against the transport costs of bringing potash from neighbouring countries? But if Britain's potash is 1,000 ft. deeper than Canada's, her need for self-sufficiency in major plant-foods is more pressing in terms of national security; should world war ever come again, potash a mile below the surface of Britain would be very much nearer than potash in Europe and across the North Sea. Solely as a part of the defence programme, there still seems that much is to be said for proceeding even at high cost with the development of the Yorkshire deposits.

## Particle size

THERE is considerable interest in the United States in the development of granular insecticides and weedkillers. Still very much in the experimental phase—for the earliest papers on the subject are dated 1953—it remains to be seen whether the idea gains support from manufacturers and users. Hitherto, field applications have imposed a simple choice between dusts and sprays, and broadly speaking, the spraying method has established itself as the more effective. Now the choice is being widened and it looks as if it may be possible to consider whether broadcasting a coarse particled insecticide or weedkiller may not be the easiest method and no less effective than spraying, at any rate for certain kinds of field treatment.

The granular approach for selective weedkillers is being studied at the Virginia Truck Experiment Station (*J. Agric. and Food Chemistry*, **2** (2), 55, 1954) and it would appear that some of these substances that could formerly only be used as pre-emergent weedkillers can in granular form be used as post-emergents without danger to the growing crop. Also, the granular applications were as effective in weed control as were sprays. Another promising field is in the application of soil insecticides of the chlorinated hydrocarbon type to permanent pasture and hill grassland. The vexed problem of drift is eliminated and the granules fall through the grass foliage instead of clinging to it and creating residue difficulties. Excellent control over pests of the chafer grub type has been secured by it in experiments at Cornell University.

The granular form of these materials is derived from the 'fillers' used and not by a wetting and drying process as is used for producing granulated fertilisers. A diluent of suitable particle size is chosen and this is impregnated with the insecticide or weedkiller. Granular Fuller's Earth and coarse tobacco waste have both been used with success. Applications can be made with the various kinds of distributing machines that are used on farms.

## Wood sugar revival?

CAN the cellulose of waste wood be economically converted into sugars? This is not a new question, for it has been hopefully asked for at least 40 years. Wood sugar adventures failed completely in war-time Germany during the first world war, but the Nazi Government gave full support to the Bergius process even before the second war. Sweden produced a considerable tonnage of wood molasses for cattle feeding also during the last war. However, the general verdict has been that wood sugar products are not economic commodities once a reasonable supply of cereal feeding stuffs is available. The Bergius process, which aimed at a complete chemical utilisation of waste wood, was principally handicapped by the high cost of corrosion caused by the use of strong hydrochloric acid as the hydrolysing agent. To convert cellulose into its more edible chemical relations, the sugars, hydrolysis is essential.

Post-war German adjustments of the Bergius process have so transformed it that it may only be a matter of time before economic production of wood sugar is clearly possible. Strong acid is employed in only one section of the plant and then at a fairly low temperature. Molasses which can be used as fodder or fermented to alcohol and high-grade lignin are also produced. It is claimed that dextrose can be obtained from waste wood at approximately the same production cost as it is now obtained from corn; indeed, even if the price of corn falls by 20% it is still considered that wood-derived dextrose could compete. If these claims are correct, one of the most successful ventures of modern chemurgy—dextrose from corn—would seem to be threatened. However, many people would regard the production of an edible sugar from waste wood as an even greater triumph of chemurgy. It merely depends upon whether chemurgy is defined as the development of products only from agricultural surpluses or also from forestry wastes.

The economic feasibility of the modern German process will probably vary with the circumstances of different countries. In Germany there is not a large surplus of corn and there is an abundance of waste wood, but in America the piling surplus of dollar-frozen cereals is bound to act as a deterrent upon any proposals to produce dextrose from wood instead of corn. Wood hydrolysis processes have hitherto been dismissed as uneconomic for introduction into Britain, but our annual accumulation of waste wood is very high for a relatively thinly afforested country. Unfortunately, sawdust cannot be used as the starting material for the new process and wood chip waste must be used. If further improvements could enable sawdust to be employed, the threat to corn would be bigger and closer.

## Quality in cereal proteins

IT has long been appreciated that proteins of animal origin are of superior biological value as compared with those of vegetable origin, but it is a new and rather startling idea that among vegetable proteins, especially those derived from cereals, there may be considerable variations in their nutritive value and that it may be advantageous to supplement or substitute proteins from one source by those derived from another. Nevertheless, that is precisely what Prof. J. Barnett Sure, of the University of Arkansas, claims to have established as the result of investigations carried out with the assistance of a number of co-workers and described in a paper recently published in *Agriculture and Food Chemistry* (I, p. 20), an official publication of the American Chemical Society.

The author claims to have demonstrated the low biological value of the proteins in milled wheat flour and milled white maize meal and the superior nutritive value of those derived from rice. His investigations were carried out on groups of albino white rats, of which each animal was weighed once a week and accurate records kept of its food consumption. The only sources of protein in the ration were milled wheat flour, milled maize flour and milled rice, the remaining parts of the ration providing the necessary carbohydrates, roughage and supplies of vitamins. It was found that when one-half the proteins in milled wheat was replaced by an equivalent amount of the proteins in rice there was 114.1% increase in growth of the rats and 85.7% increase in the protein efficiency ratio, while when one-half the proteins in milled maize was

replaced by equivalent amounts of proteins in rice the increase in body weight amounted to 236.2% and protein efficiency increased by 164.6%. These effects are interpreted by the author as being due to the protein and amino acids in milled rice and not to other components of the product.

Rice has hitherto been regarded as a somewhat ill-balanced food in itself, altogether apart from disabilities caused by vitamin deficiencies induced by defective or ill-balanced milling methods; the general view has been that as a food it is inferior to wheaten flour. If these results are substantiated, this view stands in need of revision. It is surprising also that rice, the standard food of the races of the Far East, should be superior biologically to the maize meal which is the standard basic breadstuff of peoples in so many parts of the world, *e.g.* the southern states of the U.S.A., Central America, South, East and Central Africa and parts of Europe, *e.g.* Jugoslavia.

If these results are borne out by further experiment, it would seem most desirable that people of low income level who depend on maize meal for their basic cereal food should consume a greater proportion of rice to balance the protein deficiencies in maize. It also seems to furnish additional support for the efforts now being made in many countries to extend the production of rice to meet the demands of Eastern people who are habituated to a rice diet and do not willingly accept other cereals, while the predilection of many races for a rice diet may have a sound dietetic foundation.

## A new seed treatment

RESEARCH by the Plant Diseases Section of the New Zealand D.S.I.R. recently reported in *Nature* (**173**, 217, 1954) increases the prospects of carbon tetrachloride as a seed-dressing chemical. A few years ago workers had shown that this liquid can be satisfactorily used for treating seeds of the pea and bean families; now it is clearly proved that carbon tetrachloride also gives excellent control over seed-borne diseases of linseed. These are seeds to which the hot-water steeping treatment is commonly applied. The hot-water method has two disadvantages. The margin between combinations of time and temperature that kill disease organisms, but which do not have adverse effects upon subsequent germination is very narrow. Secondly, the water treatment must be followed by artificial drying. Although slightly longer times of steeping at higher temperatures are needed with carbon tetrachloride, there is a wider margin between these conditions of disinfection and the time-temperature combination that brings about reduced germination or reduced seedling vigour. Twenty minutes' steeping at 65°C. gave complete control over both seed-borne pasmo and 'browning'; but it required 20 to 30 minutes at 70°C. to 75°C. (according to variety) to produce significant signs of reduced germination. No absorption of carbon tetrachloride by the seeds seemed to take place.

Owing to the volatility of this liquid, drying after treatment is not needed, but a specially designed apparatus for steeping is necessary so that the carbon tetrachloride vapours can be condensed and recovered.

The use of solid seed dressings with this type of seed has always been handicapped by the difficulty in getting them adequately to cover the smooth surfaces of the seed coat. To offset this higher than normal rates of dressing have often been used. Carbon tetrachloride is neither a scarce nor highly expensive chemical. Its previous services to agriculture have been somewhat indirect, mainly being in its use as a diluent for liquid insecticides employed in grain store fumigation; here it is the physical properties of carbon tetrachloride which have been helpful rather than the very slight insecticidal capacity it possesses.

Further studies of carbon tetrachloride as a seed fungicide for pre-sowing control will no doubt follow these encouraging reports. A fairly wide range of seeds may be found to withstand carbon tetrachloride steeping without damage but with effective destruction of parasitic spores. With a very low toxicity and, in any case, with speedy removal of residues by evaporation, carbon tetrachloride is the type of chemical applicant that should be developed to its fullest practical extent.

## World wheat pact sales

OVER six months have now elapsed since the new International Wheat Agreement came into effect on August 1 last and it has become evident that importing countries have been noticeably slow in taking up the quotas allotted to them under it. These have been greatly reduced by the withdrawal of the United Kingdom from the agreement; nevertheless the total amount of wheat sold by the exporting countries under the new agreement amounted to only one-third of the total export quota allotted to them.

It appears that, according to a statement recently published in the London *Financial Times*, Austria, Brazil, Denmark, Italy, Jordan, Korea and Sweden have so far not bought one single bushel of wheat under the new agreement, Ireland, Mexico and Peru have taken very small quantities, while India has only taken 345,000 bushels out of the annual quota of 36.7 million bushels allotted to her. It further appears that the policy of the exporting countries under the agreement, of keeping or endeavouring to keep prices at the maximum allowed, has had the result of providing a protective umbrella under which non-participating exporting countries have been able to expand their sales. Thus it appears, for example, that Argentina, Turkey, France, Sweden, Russia and the Balkan countries have had no difficulty in competing successfully for export business, while sellers under the agreement are apparently afraid of lowering prices below the maximum to a really competitive extent, probably for political reasons.

It is still early days, but some conclusions seem to emerge, *viz.*, (1) that the decision of Great Britain to withdraw from the agreement is finding its justification from events, (2) that, as suggested by the *Corn Trade News*, the general trend of production and demand may well culminate in the disappearance of the agreement and (3) that monopoly selling schemes based upon attempts to fix maximum prices at too high a level for the benefit of producers may be an outmoded and outdated policy.

# The Economics of Peasant Cane Farming in Trinidad

T. B. WILSON, B.A. (Oxon), Dip. Ag. Econ., D.T.A.

*The following study of the economic circumstances of the so-called cane farmers in the sugar industry of Trinidad is worthy of careful study: in many countries production of export crops by peasants is increasing, but if ever peasant production is to equal production by plantations great changes are needed in the organisation and the work of peasant holdings. The weaknesses of the system of peasant cane production are well brought out in this article and the directions in which changes are needed are clearly indicated. The author was a post graduate research student at the Imperial College of Tropical Agriculture in Trinidad, where the investigations on which this article is based were carried out.*

PRACTICALLY all the main cane sugar producing countries of the world have now a cane farming industry. At present cane farmers operate in the British West Indies, South America, Queensland, Natal, Cuba, Puerto Rico, Mauritius, Hawaii and Fiji. In some of these countries cane farming is a minor, in others a major, contributor to the sugar industry.

Trinidad, relatively wealthy by West Indian standards because of its oil and asphalt, has nevertheless a typical tropical agricultural economy, in which sugar is the dominant export crop. Almost two-thirds in value of the annual agricultural exports is contributed by sugar, cocoa beans being roughly half as valuable. In Trinidad cane farmers grow roughly one-third of the island's crop and cultivate half of the total cane acreage.

## Definition

The cane farmer is essentially a grower, but not a processor, of cane. The processing of sugar cane into cane sugar is performed by sugar manufacturers, most of whom also grow cane, although there are instances where they operate a factory only. Trinidad cane farmers, with few exceptions, are peasants with less than 5 acres of land, cultivating by extensive methods. The sugar estates in contrast are large-scale plantation organisations cultivating between 2,000 and 20,000 acres and employing intensive methods.

The growing and processing of cane are separate but closely interrelated activities. The rapid way in which the sucrose content of the cane deteriorates after harvesting imposes transport limits, while the cost of modern manufacturing machinery and the necessity for efficient manufacture and marketing of the crop increase the degree of interdependence between farmer and factory.

The minimum functions of the sugar estate in relation to the cane farmer are those of milling and marketing, but they may also be extended to those of landlord, employer, supplier of seed, fertilisers or equipment, creditor and agricultural supervisor. The extent of these activities, and especially the degree of control exercised by the management depends on whether the farmer is an integral part of the plantation, *e.g.* a ' tenant ' of the Colonial Sugar Refining Co., Fiji, or an independent peasant. The Trinidad cane farmer is mainly an independent peasant.

In 1949, the Soulbury Commission Report on the sugar cane industry of Trinidad estimated that there were 10,000 cane farmers cultivating 40,000 acres and producing one-third of the island's crop. This was a considerable decline from 1921, when they numbered over 26,000. All cane farmers are descendants of the original plantation labour forces imported in earlier days under various types of contract from Africa, China, Madeira, Malta and India.

**Cutting sugar cane at Caroni**

The majority are either ' West Indians ' —descended from African slaves—or ' East Indians '—the descendants of indentured Indian labourers introduced from India between 1845 and 1917. The first cane farmers were West Indians, but since 1905 the East Indians have become numerically predominant and now outnumber the West Indians five times, who have been attracted to urban life and employment.

## History

The first delivery of farmers' cane, 320 tons, was made in 1882 to the Usine Ste. Madeleine, where Sir Neville Lubbock, K.C.M.G., the managing director, was the first planter to encourage cane farming in the face of some opposition from other planters who feared that the system would undermine the supply of plantation labour on their estates. During the next 25 years cane farming steadily grew and was welcomed as providing a solution to the economic difficulties of the plantation sugar industry; it was, indeed, largely because of the cane farmer that the Trinidad sugar industry was able to survive the ' danger of imminent collapse ' which the West Indies Royal Commission of 1896 showed to threaten the West Indian sugar industry as a whole as a consequence of low prices and the rapid spread of cane disease.

Cane farming was a solution to many of the problems of estates; the cost of a full-time labour force throughout the year was reduced by using part-time labour at the peak labour periods, such as harvesting. The cost of recruitment, transportation, housing and feeding of labour from overseas was reduced and much labour was employed on a purely cash basis and could

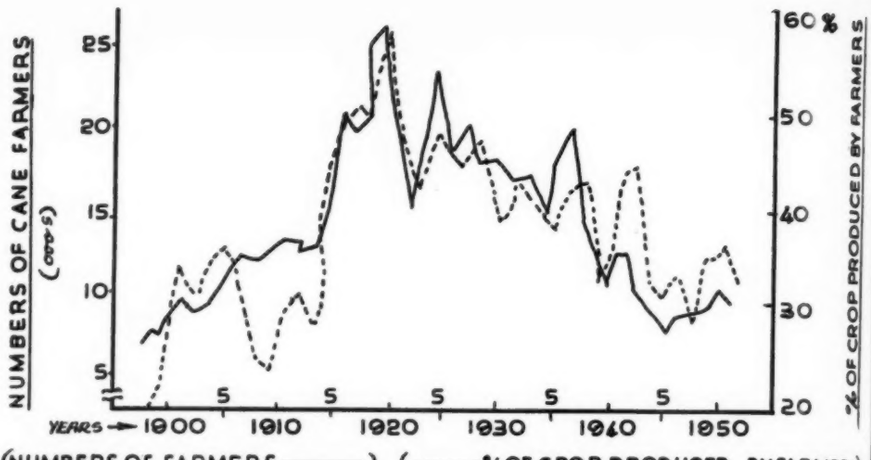
be kept in the industry by giving the labourers land to grow canes. This lowered considerably the cost of production of estate canes, while the farmers also offered an outside source of cane supply at a cost per ton at least 2s. less than canes from estate cultivation; this continued for the next 20 years (Graph 1).

Many sugar estates were, however, unable to survive for lack of financial resources or unfavourable soils or inefficient factory equipment. Increased efficiency in processing became associated with factory size. Some estates discontinued cultivation and operated only their factories, processing the cane grown by farmers who had previously been their estate labourers. When these estates disappeared their lands were bought by neighbouring estates or more often continued as landlord investments, rented out annually to cane farmers. Two-thirds of the farmers are now not tenants of the estate to which they deliver their cane. The usual layout of a sugar estate now is a centrally located factory, surrounded immediately by the estate cultivation, then by tenant farmers, with some farmers between 5 and 10 and even 15 miles away from the factory.

### Relations with the estate

Each factory buys farmers' cane from only one area, limited by an agreement made between the sugar estates in 1921. This zoning is in effect a marketing monopoly, but was desirable in order to minimise transport of a bulky and perishable crop and to provide some control over 6,000 scattered and independent cane farmers. The high price of sugar between 1915 and 1920 resulted in intense competition among the estates for farmers' canes. The system of crop advances which had been developed to encourage cane farming broke down in 1920, when money was advanced to farmers out of proportion to the crop values. The zoning is still in force and is satisfactory, though there is now some need for revision of the areas to a form more appropriate to the changes in the size and policies of the individual estates.

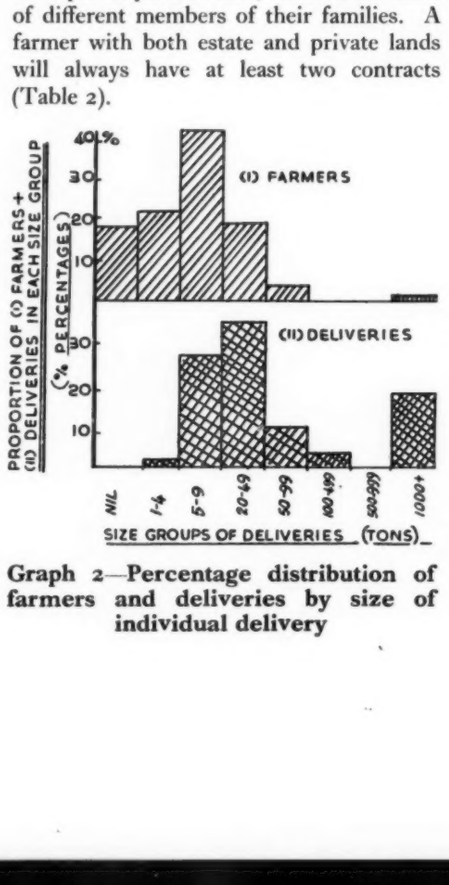
The estates may act as landlords to farmers both for agricultural or house plots. Money may be advanced on the security of the growing crop, to be repaid at harvest. Fertilisers and small tools may be supplied against cash or credit. Many farmers and members of their families earn wages in estate cultivation or factory employment and at harvest farmers' carts supplement the estate carrying capacity for the transport of estate canes. The extent of these functions varies on different estates. One estate buys 45% of its milled cane, while another buys only 15%, and many other factors may influence policy towards farmers (Table 1).




**Graph 1—History of farmers, their numbers and relative importance**

### Predominance of small-scale farming

Information about the internal organisation of cane farming has become available as a result of a recent economic survey which statistically sampled 1,500 farmers, or one-sixth of the island's total of 9,993 farmers. It was found that the numbers of 'farmers who contract' with the estates to deliver cane was 15% greater than the actual number of farmers with separate farms. The contract system was established in 1937 under the International Sugar Agreement and was originally intended to be used in restricting production, but now only serves as a register of farmers. As a register it is not completely reliable, since peasants often take out separate contracts for separate plots of land, often in the name of different members of their families. A farmer with both estate and private lands will always have at least two contracts (Table 2).




**Graph 2—Percentage distribution of farmers and deliveries by size of individual delivery**

The average size of the Trinidad cane farm is less than 4½ acres. On one estate 70% of the farmers had farms of no more than 2 acres and delivered only 38% of the total farmers' crop (Table 3). On farms as small as this, fragmentation into small plots results in inefficiency as the plots are often separated by more than a mile. Table 4 shows that even the smaller holdings are not free from subdivision, while all the larger farms have at least two separate plots, five plots being not uncommon. Scope for consolidation exists and many farmers also have distant plots for growing food crops, such as pigeon peas, or maize, or wet paddy in the flood areas.

The average total harvest of a Trinidad cane farmer has varied since the war between 30 and 50 tons. But this is not typical, for on most estates farmers deliver less than 20 tons, the average figure for the whole island being distorted by the few farmers who grow over 200 tons and by 38 buying agents who have a contract to supply canes to the factories in bulk by hundreds of small independent growers.

The tonnage of cane delivered by individual farmers also shows some variation in different years, according to the weather. Thus in a year when the average delivery to one factory was 15 tons per farmer, only 30% of the farmers delivered over 15 tons and 58% below 10 tons, or expressed alternatively in terms of the total tonnage of farmers' canes, the 759 smallest farms (*i.e.* 58%) produced only 12% of the canes, whilst 279 farms (*i.e.* 20%) of the farmers, with over 20 tons each, delivered 47% of the total crop (Graph 2).

Farmers rent most of their land, only a small portion being owned. Some of the rented land is owned by the estates, a very small amount by other peasants, and the rest by private landlords. Rents charged by estates and Government for cane land

are low and bear little relation to its productivity; the low rents are mainly responsible for the continuance of extensive farming and improper land utilisation.

### Land utilisation

Of the land rented from estates, almost one-third is not cropped. Bush fallowing is practised to maintain fertility in preference to the application of fertilisers, although estate experience proves that land can grow cane without rotation using intensive methods.

Cropping policies vary with the size of farm, the larger farmers growing proportionately more cane. Rice is grown almost exclusively by East Indians, to whom at least ¼ acre of paddy land is a social necessity rather than an economic way of providing their staple item of food. Provision crops, *i.e.* sweet potatoes, yams, etc., are grown on the holdings of the larger farmers, and both large and small farmers have considerable areas in bush. It is curious that one-fifth of all farmers' land and up to 40% of the land on small farms less than 1 acre in size are uncultivated when Trinidad has an acute land shortage and a large agricultural population with a low standard of living.

Standards of cultivation are low. Cane is usually planted at the end, rather than at the beginning of the wet season. Cane banks are not always broken and cane is often planted in holes instead of in furrows. Pen manure is generally applied, but only small quantities of fertilisers are used. Hoeing and weeding, as well as drainage ditches, are frequently omitted to reduce the cost of cultivation, although it results in a reduction of the yields of cane.

Replanting is uneven and depends only indirectly on the relative price of cane. Farmers' canes do not exhibit a normal age distribution pattern. In 1952, for example, only 6% of the land was in plant cane. As a result, yields are low and show considerable annual variations. The ratio of acreage reaped to acreage under cane varies slightly according to the price of cane. Farmers with poor stands of cane will not cut at all in a year of relatively low prices.

Food crops, such as sweet potatoes, tomatoes, pigeon peas and okroes, are grown extensively through young plant cane; food growing is believed to be profitable, but few farmers have the skill necessary for efficient market gardening. Their food crops are usually grown when the markets are glutted and prices are low and it is not really an economic activity, but does provide some return for little extra labour once the land has been prepared for cane.

TABLE 1
NUMBERS AND RELATIVE IMPORTANCE OF SUGAR CANE FARMERS TO THE MAIN SUGAR COMPANIES OF TRINIDAD, 1951 CROP

| *Company* | *Total cane tonnage, 1951 (tons)* | *Farmers' cane tonnage (tons)* | *Farmers' tonnage to total (%)* | *No. of sugar cane farmers* |
|---|---|---|---|---|
| Ste. Madeleine .. .. | 511,113 | 228,100 | 44 | 4,603 |
| Gordon Sugar Estates Ltd... | 106,475 | 41,958 | 40 | 980 |
| Orange Grove .. .. | 118,960 | 38,329 | 33 | 1,214 |
| Caroni Ltd. .. .. .. | 463,688 | 69,623 | 15 | 1,109 |
| Woodford Lodge .. .. | 182,470 | 73,422 | 34 | 1,187 |
| Total .. .. .. | 1,382,706 | 451,432 | 32.6 | 9,093 |

TABLE 2
MULTIPLICATION OF CONTRACTS
DISTRIBUTION OF CANE FARMERS BY NUMBER OF CONTRACTS, 1952 CROP
(*Analysis of a sample*)

| *Tenant status* | *No. of contracts* | | | | *Total farmers* |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | |
| Estate only .. .. .. | 1,037 | 118 | 15 | 3 | 1,173 |
| Private land only .. .. | 96 | — | — | — | 96 |
| Both estate and private land | — | 40 | 2 | 2 | 44 |
| All .. .. .. .. | 1,133 | 158 | 17 | 5 | 1,313 |
| Percentage .. .. | 86.2 | 12 | 1.2 | 0.3 | |
| Total number of contracts.. | 1,133 | 316 | 51 | 20 | 1,520 |

TABLE 3
TABLE OF FARM SIZE
ACREAGE DISTRIBUTION OF TENANT CANE FARMERS ON AN ESTATE, WITH TONNAGE DELIVERED, 1952

| *Total acreage held* | *Cane farmers* | | *Tonnage delivered, 1952* | |
|---|---|---|---|---|
| | *No.* | % | *Tons* | % |
| 1 acre and below .. | 464 | 38.1 | 2,352 | 15.4 |
| 2 acres and above 1 .. | 378 | 31.0 | 3,500 | 23.0 |
| 3 „ „ „ 2 .. | 173 | 14.2 | 3,104 | 20.4 |
| 4 „ „ „ 3 .. | 96 | 7.8 | 2,356 | 15.4 |
| 5 „ „ „ 4 .. | 47 | 3.8 | 1,265 | 8.0 |
| Over 5 acres .. .. | 59 | 4.1 | 2,573 | 16.8 |
| Total .. .. | 1,217 | 100 | 15,194 | 100 |

TABLE 4
TABLE OF FRAGMENTATION
DISTRIBUTION OF FARMERS IN EACH ACREAGE GROUP BY NUMBER OF SEPARATE PLOTS FARMED, 1952
(*Analysis of a sample*)

| *Acreage group* | *No. of plots* | | | | | | | *Total farmers* |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | *Over 7* | |
| 0 to 1 acres .. | 447 | 17 | — | — | — | — | — | 464 |
| 1.1 to 2 „ .. .. | 223 | 142 | 10 | 3 | — | — | — | 378 |
| 2.1 „ 3 „ .. .. | 44 | 78 | 41 | 10 | — | — | — | 173 |
| 3.1 „ 4 „ .. .. | 8 | 24 | 32 | 28 | 3 | — | 1 | 96 |
| 4.1 „ 5 „ .. .. | 4 | 5 | 12 | 14 | 10 | 1 | 1 | 47 |
| Over 5 „ .. .. | — | 2 | 9 | 14 | 20 | 4 | 10 | 59 |
| Total .. | 726 | 267 | 104 | 69 | 33 | 5 | 12 | 1,217 |
| Percentage .. | 59 | 21 | 9 | 6 | 3 | — | 1 | 100 |

### Cane yields

The average yield per acre reaped in 1952 was 14.5 tons. The average yield for plant canes was 22.6 tons and not very much less for first ratoons, but the yield of canes older than this falls considerably to below 12 tons per acre. The mean yields per acre on land rented from estates for sugar growing are almost half these figures —the average in 1952 being 6.4 tons—but much of this land is, of course, not cultivated in canes.

## Labour status of cane farmers

The cane farmer is not typically a full-time agriculturist; with an average family of six persons, of whom three are working and between two and three are adults, over two-thirds of the available working time is spent away from the holding. Most of the available labour is provided by the male adults, who spend half of their time on the holding. Some income from outside the holding, and even outside agriculture, is earned by the farmer and at least some member of the family. Many employment opportunities occur in densely populated areas. The women spend just over one-tenth of their time on the holding and almost as much on outside employment, such as domestic service, dressmaking and petty trading. Days completely lost through sickness are few, but there is much loss of efficiency by poor health and diets. There is concealed unemployment and a shortage of paid agricultural work for those not prepared to seek non-agricultural employment at certain periods.

The experimental unit holdings of the Imperial College of Tropical Agriculture, Trinidad, were established in 1946 to discover systems of peasant farming which would fully utilise throughout the year the cane farmer's greatest asset, the labour available in his own family, and provide him with a higher standard of living. At present the largest single item in the farmer's expenditure on his holding is hired labour, which averages Tr.$61/-* or 38% of his total agricultural expenditure.

## The problem of seasonal credit

Indebtedness among cane farmers is widespread and the average cane farmer owes Tr.$60/- or one-tenth of his total family annual income. Two-thirds of this is domestic expenditure at the local shop. Credit at the shop is readily available to farmers known to have good incomes or adequate security in animals or mature cane. The shops perform a valuable service in providing small short-term credit not otherwise available. A few farmers have recourse to moneylenders, whose rate of interest varies between 20% and 50%, according to the borrower. For smaller sums relatives frequently help. Friends are not hard to find who might lend at 5 cents per dollar per month, and this source provides one-quarter of the total borrowing, only one-tenth of which, surprisingly enough, was in the form of advances from the estates at 6% p.a. or from co-operative credit societies at 7½%. The essential function of this credit is to even out seasonal variations in the farmer's expenditure and income, though it is important to realise that social and family functions, such as weddings, are not a small item of expense among East Indians.

**This aerial photograph was taken in March, the mid-crop period. The light patches are areas from which cane has been harvested. The factory buildings (*bottom left*) are immediately surrounded by estate cultivation—the large uniform fields. The farmers' lands (*right*) are small in size and irregular in shape**

## Farming efficiency

The average holding gross income before expenses are deducted averages Tr.$310/- per annum: only half is derived from cane, the rest being supplied by rice and ground provisions which are mainly consumed; carting and ploughing for other peasants may provide extra earnings for a few of the smaller and medium-sized farmers. Crop income per acre increases with higher yields of cane and with more expenditure on manures and labour. This is to be expected but the main influence seems to be not the size of farm, but the relative areas under different crops. Provision crops do not provide high incomes, contrary to the general belief among cane farmers. The average net income from the holding, after deducting agricultural expenditure, is less than Tr.$150/- a year, which is supplemented by an average of Tr.$155/- from agricultural and nearly Tr.$100/- from non-agricultural employment, to bring the average farmer's personal income to about Tr.$400/- a year. Farmers may depend on their holdings to a degree varying between 10% and 100%. Where farmers themselves depend considerably on their holding, the family may supplement the income by outside employment.

Some farmers lose money on their holdings. These tend to be the smaller farmers (below 1½ acres), delivering only a few tons of cane. Their expenditure on hired labour is high and the holdings are heavily subsidised by the family's outside earnings. A second group of small farmers make their holdings profitable, but derive less than one-third of their income from them. They spend considerable time on their holdings, which are cropped predominantly in cane.

A third group cultivate nearly 5 acres, mostly in cane. Although not numerous, they are important and secure the highest cane yields, deliver most cane, have the least acreage uncultivated and have the highest crop income per acre. They may, however, have considerable outside earnings from shopkeeping or rice milling, which provide them with a high standard of living.

A fourth group derive their income from their holdings, which average 4 acres of cultivated and 1 acre of uncultivated land. This group includes the most serious farmers, to whom cane farming is a definite and worth-while occupation; they have the largest number of livestock of all farmers. Their cane deliveries average 44 tons and their yields 16 tons per cane acre. Their holdings provide an average of Tr.$500/- net income, or almost Tr.$1/- per man day. This figure is, however, only half the average daily wage of Trinidad agricultural labourers and only by large family earnings off the holdings can an average standard of living be achieved.

Higher incomes are associated with two factors: first, the cropping plan, *i.e.* the

*The Trinidad $ is worth approximately 4s. 2d. sterling.

percentage of the area under different crops and, secondly, size of the farm in cultivated acres.

### General standard of living

Income earned outside the holding by members of the cane farmer's family amounts on average to Tr.$200/- a year, of which three-quarters comes from non-agricultural occupations. The total family income from all sources averages Tr.$606/- (£125), to be shared among a family of six, usually containing three adults. The standards of living are determined mainly by the dependence of the farmer on the holding and by the size of the outside earnings. Cane farming is a vital undertaking only to the less prosperous members of the community and for the most part is a part-time and minor activity.

### Organisation of the cane harvest

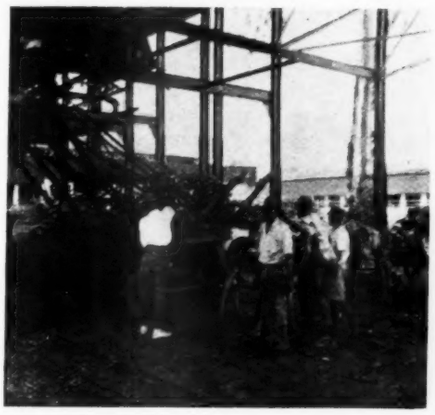
Farmers' canes must be reaped in accordance with a schedule of harvesting designed to provide a regular supply of canes to the factories during the three-month cane harvest, for manufacturing efficiency depends largely upon a continuous and even employment of the full capacity of the factory.

The estates issue cutting passes to individual farmers authorising them to deliver cane to scales in the factory yard or in the field. The passes are given as the cane becomes mature, first to the larger farmers who can guarantee a regular supply of cane and have adequate transport available. The pass gives permission to cut cane, but does not order the farmer to cut on a particular day. There is no guarantee that the farmers will deliver even supplies to the factory. This lack of control over farmers results in a considerable element of unreliability in their deliveries.

Considerable variation exists in the daily amounts of cane delivered by individual farmers and from individual areas; to some extent these are self-cancelling, but there is still a larger degree of uncertainty than is permissible for efficient running of a factory. Consequently, the estates tend to issue passes to more farmers than are necessary to deliver the required amount as an insurance against inadequate supplies.

Table 5
Table of Daily Carting Capacity
Distribution of a Sample of 514 Carts by the Number of Loads made per Cart per Day

| *No. of loads* | *Factory scale* | | | | *Field scale* | | | |
|---|---|---|---|---|---|---|---|---|
| | *Owned* | % | *Hired* | % | *Owned* | % | *Hired* | % |
| 1 | 9 | 6 | 6 | 5 | 44 | 22 | 11 | 21 |
| 2 | 41 | 27 | 28 | 25 | 109 | 54 | 30 | 58 |
| 3 | 59 | 39 | 37 | 33 | 40 | 20 | 9 | 17 |
| 4 | 29 | 19 | 35 | 31 | 4 | 2 | 2 | 4 |
| 5 | 11 | 7 | 7 | 6 | 1 | 0.5 | — | — |
| 6 | 1 | 0.6 | 1 | 0.9 | 1 | 0.5 | — | — |
| Total .. | 150 | | 113 | | 199 | | 52 | |



**Cane being unloaded on to the elevator in the factory yard**

Farmers deliver their canes to scales or weighing points, where they are bought by the estate and the amount credited to each farmer's account. The scales are usually within 2½ miles of farmers' plots. There is some control over the maximum deliveries by farmers by limiting the number of passes or the number of field railway trucks for transport from scale to factory, or by restricting the farmers to one or two loads each per day. But the estates are unable to control the minimum deliveries of farmers' canes.

### Transportation costs

A long queue of farmers' carts carrying approximately 17 cwt. waiting to deliver their canes is a traditional feature of Trinidad cane harvests; the size of the queue differs at various times. The scales in the factory yard are usually open 12 hours—6 a.m. to 6 p.m.—and the average number of carts waiting at any one time is 17, with a peak that may be double that number. A queue invariably exists at the scales in the field, where the scale is open daily for a shorter and unknown period and closes whenever the allotted number of field railway trucks have been filled.

Some carts usually remain in the queue when the scale closes down and other carts may join it, being left loaded and on props overnight. The average time spent in waiting before delivering is between 25 and 30 minutes at the factory and over 1 hour and 40 minutes at the field scales. This period of waiting is a complete waste of time for cart, animal and attendant, which results in a reduction in the number of loads a farmer can deliver in a day. This limitation of transport reduces the delivering capacity of the farmer; as a result both cutting and carting costs per ton are increased.

A comparison of the average number of loads per day delivered by owner-carters

**Sugar cane at Caroni awaiting transport to the factory**

and hired carters emphasises the extent of this limitation (Table 5). The limitation on delivery at the factory scales is the cutting capacity and at the field scales the carting capacity of the farmer.

Six out of every 10 loads of farmers' canes are carried in carts which are hired and not owned by the farmer. Hired carts are paid according to the tonnage of cane carted to the scale and this includes both loading and carting.

The limited amount of sugar cane which the Trinidad cane farmer can cut and cart determines to some extent the total amount of cane he can grow. Basically the inefficiency at harvesting results from the large number of farmers engaged in the industry, the small scale of the majority and the element of unreliability in their deliveries. There can evidently be no possibility of increased efficiency in cane farming until there exists a smaller number of farmers growing cane in larger quantities and a more satisfactory degree of estate control over their deliveries. Improvement is needed in the organisation of both the individual holdings and the whole cane farming industry.

The next few years will be a severe testing time for the cane farming industry. Today in Trinidad there is a rapidly increasing population, shortage of agricultural land and continuous reduction in estate production costs, owing especially to the centralisation of weed control and transport and to mechanised cultivation. In the world generally intensive and scientific methods are being increasingly used for the cultivation of sugar cane. The cane farmers will not survive except by immediate revolutionary changes in their traditional methods.

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# *Australian Farming Notes*

*(From our Australian correspondent)*

### Protein content of wheat

The chairman of the Australian Wheat Board, Sir John Teasdale, thinks the strength of Australian wheat should be built up to at least 10% protein. The board was aiming at this by developing longer rotations in wheat growing. The protein content of wheat could be improved by building up the nitrogenous content of the soil with the growing of legumes between wheat crops. Such a change of technique would necessitate cutting down the area sown under wheat to make room for clover crops. The president of the Victorian Bread Manufacturers' Association, Mr. H. Doherty, believes that the low protein content of Victorian wheat was due to farmers 'tiring' their land with successive crops. Mr. Doherty said that the protein content of Australian wheat had dropped about 2% in the last few years.

### Queensland scheme failure

The Peak Downs grain and meat scheme in Queensland is being closed down after having lost £826,161 in five years. The scheme originally cost Queensland and Great Britain £2,500,000. The Queensland-British Food Corp., which controls the 700,000-acre project, is trying to find a buyer for a great quantity of machinery. The major plant in the project included 130 farm tractors, nine construction tractors, 130 ploughs, 137 combines, 106 headers and 111 assorted motor vehicles.

### Rice prospects

A large and unsatisfied market for rice could be exploited by Australian rice exports—which last year totalled 53.4 million lb. and earned £1.8 million—provided the price could be kept down to the level of Asian production costs. A recent survey of the Australian rice industry points out that, if the trials now being undertaken in North Australia meet with success, this country could play an important role in alleviating the basic Asian rice shortage. The survey believes that, in spite of a possible decline in prices, there is good reason for confidence that export returns will remain attractive to growers on the large mechanised farm units which will form the basis of any future development in Australia.

### Wheat problems

The Secretary for the Department of Agriculture, Mr. Crawford, said recently that he had no doubt that the wheat outlook in Australia was very sound, with the promise of lower production costs. He said that the short-term wheat position was a difficult one. Australia should follow the lead of Canada and the United States and keep larger stocks on hand than in pre-war years. There was a need to get back to the concept of war-time stocks of wheat, but there was no reason to expect that either Australia or Canada and the United States would face catastrophe in the world wheat market. However, he considered there was sufficient justification for drawing attention to the present wheat storage problem. Mr. Crawford stated that there was sufficient reason for wheat sales to be moving slowly. Domestic production last year in many European countries was well above average. But the biggest single factor was that Britain was unloading large stocks to mills that would normally be importing wheat.

West Australian wheat growers have been told that they might have to store wheat from the 1954-55 harvest on their farms. The West Australian growers' representative on the Australian Wheat Board, Mr. G. Simpson, has explained that Australia must plan for a carry-over which might total 60 million bushels at November 30, 1954, compared with a normal carry-over of 20 million bushels. Even if the 1954-55 harvest were no better than normal, farmers must still face the possibility of holding wheat on their farms. However, a severe drought in any of the major exporting countries could alter the position.

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## *University of Bristol Courses*

Post-graduate courses leading to diplomas in horticultural science and plant pathology have recently been instituted in the University of Bristol. They are conducted at the Horticultural Science Laboratories, Bracken Hill, Leigh Woods, Bristol, and at the Long Ashton Research Station. The courses are intended primarily for honours graduates in science who seek careers in horticultural research, at home or abroad. They will present a survey of the appropriate branches of applied science, together with instruction in the elements of horticultural practice and of crop experimentation. Visits to other research stations and to commercial growers, shows, etc., are also included.

The curriculum in each case commences in September and extends over a full session of three terms, attendance for additional practical work being required for part of the normal University vacations. An examination, theoretical and practical, is held in June. Opportunity will be available for original investigation, the results of which may be taken into account in the award of a diploma. The inclusive fee for either course is £37. Forms of application and further particulars may be obtained from the Registrar.

# The Mississippi Farmer Owned Fertiliser Plant

JOHN GRINDROD, B.A. (Com.)

*The inception of the new farmer owned factory for the production of synthetic nitrogenous fertilisers at Yazoo, Mississippi, in the United States, represents a new development which may in due course find its reflection in other countries.*

BELIEVED at the time to be the only farmer-owned nitrogen undertaking, the multi-million dollar plant of Mississippi Chemical Corp. at Yazoo City first came into operation in June, 1951. Because this makes possible increased deliveries of fertilisers to farmers and involves a new and cheaper method of fertilisation, it should do much to stimulate crop production, *e.g.* of cotton, corn, oats, tung nuts, sugar cane and pastures, etc., in this part of the southern United States.

## History of the project

The history of the Mississippi Chemical Corp. began in August, 1947 when the Board of Directors of the Mississippi Farm Bureau Federation was discussing ways and means of increasing the supply of nitrogenous fertilisers to local farmers. Although the suggestion that the farmers should make their own nitrogen fertilisers seemed not very practical at the outset, a committee was formed to investigate the proposal and later in the year a campaign was launched in a number of the Mississippi counties to ascertain how much capital farmers would be prepared to subscribe towards such a scheme. The results of this were sufficiently encouraging to warrant a full-scale programme being launched.

In the meantime the Farm Bureau approached the Mississippi Agricultural and Industrial Commission with a request that they would prepare an estimate of the cost of construction of such a plant and a study of factors relevant to the project. This was done and proved of great assistance throughout the planning and promoting phases of the scheme.

## Launching the project

With a view to getting the scheme under way a committee of 26 members was organised and incorporated under the name of the Committee on Nitrogen Plant for Mississippi Inc. The first steps taken were to inaugurate throughout the state of Mississippi an intensive campaign to publicise the scheme, showing advantages and 'promoting' it among the farming communities. To this end the committee approached the state legislature to obtain authority for the State Marketing Commission to expend $50,000 for this purpose. This proposal was introduced and adopted in the 1948 session of the state legislature and the campaign was begun thereafter.

The capital raised from farmers was put in trust with an understanding that, should sufficient funds not be raised to complete the project, the amount subscribed would be refunded. By the end of October, 1948 approximately $2,500,000 had been subscribed and the Mississippi Chemical Corp. was launched. During 1949 the scope of the scheme was widened to allow farmers from neighbouring states to subscribe, and during ensuing years considerable blocks of the stock were sold to farmers in Alabama, Louisiana and Kentucky.

## Finance

Altogether the corporation has invested over $7,500,000 in the plant, while an additional $850,000 has been used as working capital, organising expenses, etc., making a total of $8,300,000. Funds for this were obtained as follows:

| | $ |
|---|---|
| Sale of ordinary stock .. | 4,200,000 |
| Yazoo County B.A.W.I. bond issue .. .. .. | 750,000 |
| Reconstruction Finance Corp. loan .. .. | 3,350,000 |
| | $8,300,000 |

## Rights of participating farmers

The rights of farmers to purchase fertilisers have been incorporated into the subscription agreements and the corporation has undertaken to make available to each stockholder a *pro rata* share of the output of the plant, according to the relation of his holding of stock to the total subscription. The stock certificates have imprinted on them 'The ownership of each 15 shares ($75) of common stock in the corporation shall give the holder thereof preferred patronage rights to purchase during each fiscal year of the corporation one ton of ammonium nitrate or one-half of one ton of anhydrous ammonia at the option of the holder.' The Board of Directors has authority to raise or lower this allocation

**The Mississippi Chemical Corp. plant from the air**

as the production of the plant warrants. In addition, all excess of the selling price over the production cost of commodities sold to stockholders is to be refunded to each stockholder in proportion to his holding in the corporation; in other words, stockholders are to get their fertiliser at cost, subject to small dividends on the ordinary and any preferred stock that may be issued, and to the setting up of reserves and sinking funds.

### Erection

The corporation, after careful examination of the design of the proposed plant, appointed the Girdler Corp. of Louisville, Kentucky, engineer-contractors for its erection; the plant was constructed on a 480-acre site three miles north of Yazoo City in Yazoo County. The firms which supplied the major equipment included the Westinghouse Corp. (electrical materials), Babcock and Wilcox (boilers), the Bethlehem Steel Corp. (heavy steel forging for equipment), etc. In all about 600 official purchase orders were placed in connection with the project.

### Raw materials

The principal raw material used in the processes carried out by the Mississippi Chemical Corp. is natural petroleum gas. A contract was signed with the Southern Natural Gas Co. for an adequate supply of gas covering a 20-year period beginning in 1951. Other raw materials are obtained on the open market at current prices. Electric power is used for compressor drives and other purposes, while water is obtained from wells on the plant site.

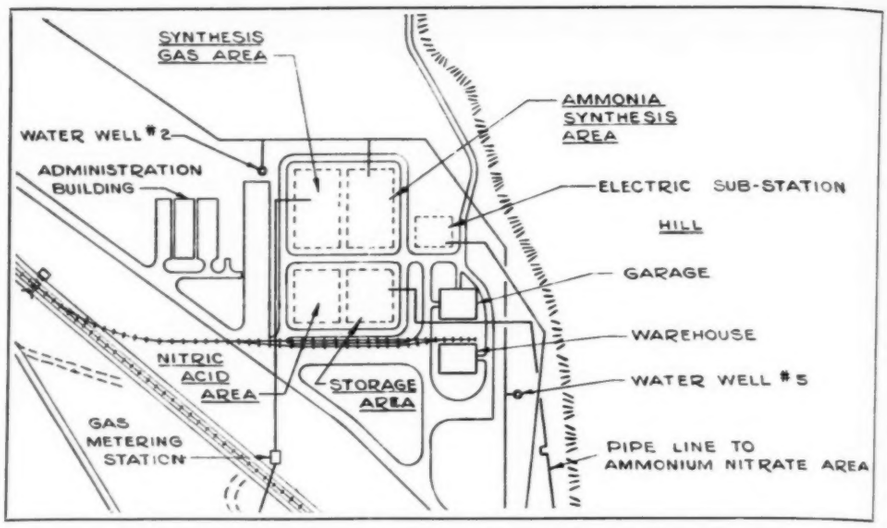
### Processes employed

The primary purpose of the company is to produce nitrogen compounds for use in agriculture and the key compound turned out at the plant is synthetic anhydrous ammonia, produced by a modified Claude process based on natural gas and atmospheric nitrogen as the primary raw materials.

The designed capacity of the ammonia plant is 120 tons per day. Of this, 60 tons is available for direct application as liquid fertiliser and the remaining 60 tons converted into ammonium nitrate. Of the latter, the daily output is 140 tons. It is made into prills under licences and patents of the Canadian Patents and Developments Ltd. The necessary nitric acid is produced by the Du Pont process under licence from the Du Pont Co. The liquid ammonia is prepared in mixing vessels, from which it is pumped to tank cars for shipment.

### By-products

Although fertilisers are the main products of the plant, the corporation also produces a number of by-products for sale on commercial markets. These include carbon dioxide and specialities such as dry ice, urea and hydrogenated oils. Should there occur periods when the demand for fertilisers is low, production can also be switched to methanol and formaldehyde.




**This diagram illustrates the main buildings of the plant**

### Distribution

Fertilisers are distributed through the existing channels of trade which embrace about 426 dealers, who are under contract to the M.C.C. to accept, store and distribute its products, which are sold at competitive prices.

No ammonium nitrate is stored at the plant. It goes out in car loads, 600 100-lb. bags to the car, or in truck loads of 300 bags to the truck. Liquid ammonia also goes out by car or truck. This weighs about 5 lb. to the gallon; a car load represents 25 tons or 10,000 gal. and a truck load 10 tons or 4,000 gal.

### Anhydrous ammonia as a fertiliser

The use of anhydrous ammonia as a fertiliser applied in liquid state to the soil is a war-time and post-war development. Shortages of orthodox fertilisers during the war encouraged cotton growers to experiment with what is, of course, the cheapest source of ammonia available. Tests in the use of anhydrous ammonia were undertaken at the Mississippi State College and its practical possibilities were tried out on about 400 farms in Mississippi, Arkansas and Louisiana. In this connection the Shell Development Corp. was active in the field of direct application of this liquid fertiliser to the soil and holds patents in connection therewith. One method of applying it is by means of propane and butane gas equipment, but when this is not available a tractor and trailer tank are used. It passes from the trailer tank through tine-like pipes which inject it into the soil.

For storage on the farm the M.C.C. has contracted with two of the larger manufacturers of high-pressure storage tanks for suitable 3,000- and 6,000-gal. storage tanks to be available for purchase by stockholders. The tanks are movable and are fitted with either box or skid supports.

### Nitrogen supplies

Nitrogen is an absolute necessity to farmers working in the southern U.S.A. and supplies both during the war and since have been anything but dependable. If they can be obtained, increased quantities of nitrogen can be used with profitable results, and for this reason the new plant is very important to southern farmers. It is held that 1 lb. of nitrogen applied to the soil in Mississippi can produce 0.4 of a bushel of maize or 0.8 of a bushel of oats or 10 lb. of seed cotton. Translated in terms of crops, the 40,000-ton annual output of pure nitrogen from the new plant represents 32 million additional bushels of maize or 64 million bushels of oats or 800 million lb. of seed cotton.

One of the chief reasons why this project gained so much support was that in the previous year, 1947, the Mississippi farmers had felt, very acutely, the shortage of fertilisers. They estimate that during that year they lost from 50 to 75 million dollars in farm income because of their inability to obtain nitrogenous fertilisers and the consequent loss of agricultural production.

### Production and consumption of nitrogen in the U.S.A.

This shortage of nitrogen has, in fact, not been a local problem in Mississippi only. It has affected the whole of the

United States and has been brought about chiefly by the world food shortage and the demand for greater output from the land, while the domestic shortage has been aggravated by the shipment of nitrogen fertilisers overseas.

The Production and Marketing Administration of the U.S. Department of Agriculture have compiled the following simplified nitrogen supply and consumption balance sheet in the U.S.A. for 1947 (the year before the M.C.C. was proposed).

| *Supply* | *Short tons equivalent nitrogen* |
|---|---|
| Production in U.S. .. | 1,401,000 |
| Imports .. .. .. | 195,000 |
| | 1,596,000 |
| Exports .. .. .. | 337,000 |
| | 1,259,000 |
| *Consumption* | |
| As fertilisers .. .. | 860,000 |
| In industry .. .. | 399,000 |
| | 1,259,000 |

## Production changes

The second world war brought about a number of changes in nitrogen production in the United States. Pre-war the major producers were the Allied Solvay Process Co., at Hopewell, Va, and Du Pont's Ammonia Department at Belle, W.Va. During the war, however, the U.S. Government spent nearly $300 million in the construction of 10 synthetic ammonia plants, which had a capacity several times larger than the heaviest peace-time consumption of ammonia. These war-time ordnance plants brought about two changes: (1) They produced ammonia in natural gas reforming plants much cheaper than in the old coke plants and (2) they popularised ammonium nitrate as a fertiliser. The latter has not had a particularly smooth passage into accepted use and it was this material that was responsible for a large explosion in Texas City early in 1947. Since then much has been done to safeguard its handling and use, but, incidentally, the new M.C.C. ammonium nitrate prilling tower is situated well away from the main block for safety reasons.

According to the U.S. Department of Agriculture in September, 1950 nine of the war-time plants, which had been provided to meet military needs, were producing ammonia, while the tenth had been diverted to other uses. Seven of these were in current production in the hands of private industry, one was being operated by the Tennessee Valley Authority, while one plant had been retained by the Army.

Of the consumption of fertiliser nitrogen of over 1 million tons in 1949-50, over 600,000 tons were produced by the war-time plants built for munitions, and in the contract for the selling or letting of these to private firms a clause was inserted providing for their resumption by the U.S. Government should they be needed in case of national emergency. Should this happen, the supply of nitrogen fertiliser available for American agriculture would be drastically reduced and might cause a serious crisis in respect of fertiliser supplies, since such an emergency would almost certainly be accompanied by a request to American farmers to produce more food.

Even with the help of ex-war-time plants, nitrogenous fertiliser production capacity was therefore barely adequate to meet current agricultural and industrial needs. Against such a background the erection of the farmers' plant in Mississippi has been welcomed in official quarters.

It is estimated that the ammonium nitrate produced at the plant amounts to about one-third of the total used in Mississippi, but already it is felt that the new plant is not large enough and plans are being made to enlarge the ammonia unit.

## *Co-operative Fertiliser Production in the USA*

Since the foregoing article was written information from the United States indicates that other farming communities have not been slow to follow the example set by the Mississippi Chemical Corp.

A recent article in *Agricultural Chemicals* by Mr. H. H. Slawson reports that late in October, 1953 a new fertiliser plant erected by the Southern States Co-operative, of Richmond, Virginia, was opened. This is stated to cover 49,000 sq. ft. of floor space, to employ 40 workers and to turn out 35,000 tons of fertiliser per year. More recently still, on November 6, 1953 another factory was opened at Briggs, Indiana, owned by the Indiana Farm Bureau Co-operative. This factory will have a capacity of 50,000 tons per year, but details of the facilities of the factory are not yet available. The Missouri Farmers' Association, Columbia, Missouri, is also working to complete a new fertiliser plant at Joplin, Missouri. This is stated to have cost $3,500,000 and aims at producing 70,000 tons of fertiliser a year, which is destinated for the Missouri Farmers' Association's members, which number over 146,000. The plant is expected to turn out ammonium phosphate and also a wide range of granulated fertilisers. In the mid-western area another large plant is stated to be in construction near Lawrence, Kansas, for the production of nitrogenous fertilisers. This is sponsored by the Consumers' Co-operative Association and the members claim that it will be the largest and most costly venture ever undertaken in the United States by a farmer-owned co-operative. Its completion is expected to take place in the current year and it will produce annually 83,000 tons of ammonium nitrate and 63,200 tons of anhydrous ammonia. Other groups of co-operatives are reported to have been making progress, both in the erection of fertiliser plants and also in the development of natural phosphate deposits, in a number of localities. It seems obvious that the undertaking described in the article has been the forerunner of many similar projects.

**An aerial view (by Whites Aviation Ltd.) of sugar cane fields in Fiji which H.M. The Queen saw from the air during her recent visit to the colony**

# Grain Drying in Tropical Countries

A. G. THOMSON

IN many countries in the sub-humid tropics grain can usually be harvested in a fairly dry condition, with moisture contents sufficiently low that risk of deterioration by reason of excessive humidity during storage is obviated. Under such conditions drying of grain does not present the problem often experienced in temperate climates, such as the United Kingdom or Europe, where it is frequently necessary to resort to artificial drying. In some tropical countries, however, grain is grown in regions where such conditions do not prevail and where humidity is so high as to preclude drying in the field. Such conditions occur in parts of West Africa, in the humid tropics of South-East Asia and in tropical South America, *e.g.* in the Amazon basin. Most of the world's rice is, in fact, grown under such conditions and, although much of it is produced on very small holdings where there is abundant labour, and sun drying with movable protection by, for example, tarpaulins, in the event of rain, is usually feasible, nevertheless when rice is grown on a large scale using mechanical methods it seems probable that the traditional methods will no longer be practicable. Artificial drying of paddy is, in fact, already practised in the U.S.A.; it is also being used in British Guiana and with the fruition of the schemes for development under the Colombo Plan it seems likely that artificial drying will have to be introduced on an increasing scale.

In regard to other types of grain, in drier climates it is often practicable to leave grain, *e.g.* maize or sorghum, in the field long enough for it to dry naturally. This obtains in many parts of Africa and in such conditions it is unusual for grain-buying centres to open until the grain has had time to get quite dry in the field. In Northern Rhodesia, for instance, any extension of the time available for handling grain would have a favourable effect on the present transport bottleneck which occurs at certain seasons. If the means for artificially drying grain were available there it would be possible to make an earlier start on the collection of grain from farms. Even if only 10% of the maize crop could be dried so as to enable it to be handled, say, a month earlier, transport difficulties would be greatly eased. It seems that requirements might possibly be met if portable or semi-portable grain driers could be made available which could be transported to farms or to collecting stations serving farms.

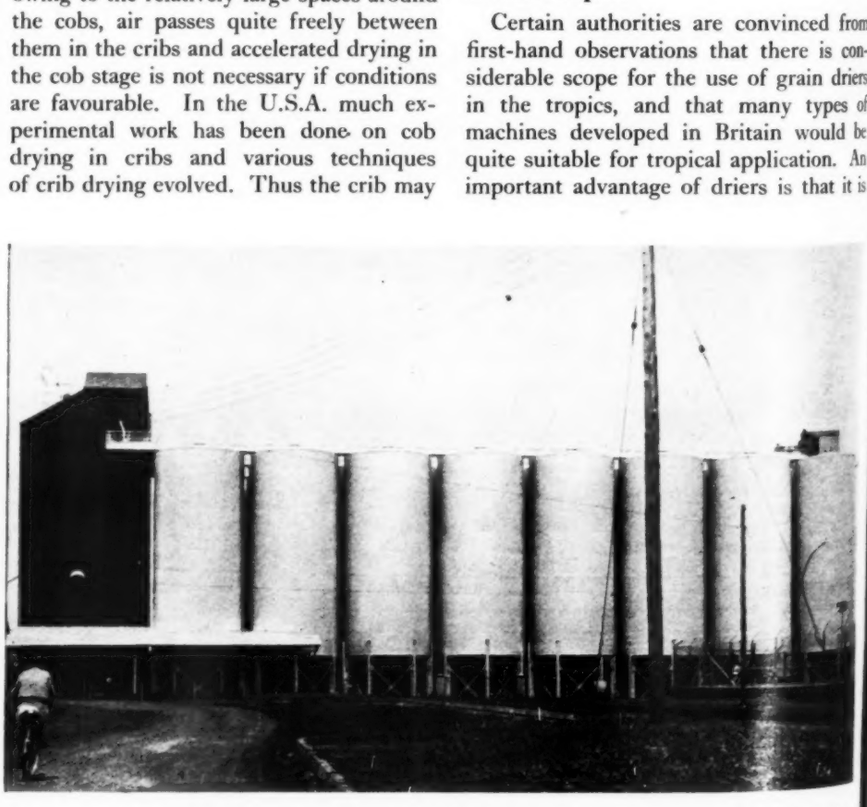
*In tropical countries grain is for the most part grown in small quantities by peasants. Usually grain drying to ensure that moisture contents are low enough to avoid risk of spoilage is accomplished by drying in the air. In other conditions it may be that artificial drying as practised in Europe and America could with advantage be introduced.*

## Maize drying

Maize differs from other cereals inasmuch as moisture has to be removed in two stages, for both the grain and the cob to which it is attached are moist and have to be dried to enable the maize to be shelled efficiently. Consequently the moisture has to be partially removed from the maize and the cob. This often is done in cribs and, owing to the relatively large spaces around the cobs, air passes quite freely between them in the cribs and accelerated drying in the cob stage is not necessary if conditions are favourable. In the U.S.A. much experimental work has been done on cob drying in cribs and various techniques of crib drying evolved. Thus the crib may be partially blocked by hessian or boards so arranged that air can be blown through the cobs, a very simple axial fan sufficing to supply the air pressure required. Owing to the large volume of air used a very small temperature gradient is needed to dry the cobs, although it is quite possible to use heat from an engine. An old aeroplane propeller installed on an automobile engine and blowing air through grain on the cob can, for example, dry it economically and effectively. An alternative is to use a drier. Some of the ordinary grain and grass driers are readily adaptable for drying maize on the cob. Driers of the horizontal conveyor type are usually quite suitable for this purpose. It has been suggested that, in this type of machine, drying would be so rapid that the grain would be dried before the cob. The machine could therefore deliver the dried grain to the sheller before the water in the cob had been able to escape into the grain, thereby avoiding any waste of energy in drying the cobs.

## Scope for artificial drying in the tropics

Certain authorities are convinced from first-hand observations that there is considerable scope for the use of grain driers in the tropics, and that many types of machines developed in Britain would be quite suitable for tropical application. An important advantage of driers is that it is



**This plant at Jinja in Uganda is one of the largest grain drying and conditioning plants in the tropical Colonial territories. The black building on the left houses a Robinson grain-drying plant of 10 tons per hour capacity**

**A Butterley-Goodall drier dealing with maize at Moshi in Northern Tanganyika. In this machine the grain is dried on a series of horizontal, louvred trays by hot air blown through the louvres. Grain is made to move along the trays by a bumping motion, imparted to them by cams**

possible to use them in such a manner that all insect pests are killed.

In order to achieve reasonably rapid drying the machines must be operated at temperatures considerably higher than atmospheric temperatures. The high temperature facilitates the flow of heat to the grain in sufficient quantity to evaporate the water which is to be removed, and it also increases the rate of diffusion of moisture to the surface of the grain. Accompanying the supply of heat there must be a sufficient forced draught of air to carry away water vapour. In nearly all drying machines the draught of air is heated, so that it can serve the dual purpose of conveying heat to the grain and carrying away water vapour from it. All drying machines in which the grain is heated must have provision for cooling the grain before discharge.

### Stages in drying

In machines which have only a single hot-air drying stage only one drying temperature is possible. Machines are available however, which provide two or more hot-air stages, so that the treatment may be graded to give a safe but efficient temperature at every stage of drying. When drying for feed neither viability nor physical characteristics are important and temperatures as high as 180°F. can usually be tolerated, so that a single drying stage is entirely satisfactory. When drying for seed, however, or when drying wheat for milling, precautions must be taken to avoid damaging the product through excessive temperature and a multi-stage drier should therefore be employed.

### Drying paddy and rice

Rice requires careful drying in order to avoid the production of cracks, which would cause the kernel to drop apart when milled. It seems probable that the cracking of rice is caused not so much by high temperatures as by over-rapid drying, or by drying followed by reabsorption of water. Rice should therefore be dried slowly. When using an ordinary British drying machine—designed not for rice, but for wheat—it should preferably be passed through the machine two or three times, reducing the moisture a little each time. Only one British manufacturer is building rice driers; his products have a long column and are designed to treat the grain gradually.

**The most primitive form of drying and storage. Maize cobs hung in trees in this way are coming to equilibrium with the atmosphere in exactly the same way as cobs stored in cribs**

It is nearly always worth while pre-cleaning grain before drying, this usually being accomplished by a simple vibrating sieve. The primary purpose of this treatment is to remove straw, weeds, rubble and other foreign bodies which check the movement of grain through a drier.

### Driers suited to tropical conditions

The most suitable driers for tropical territories are probably those running on oil fuel. The cheapest fuel in tropical countries is usually wood, but it is difficult to use wood in most simple farm grain driers because of the absence of heat exchangers. A drier despatched to Tanganyika, however, was provided with a heat exchanger, this being a common form of equipment for driers manufactured in Britain for the rice-growing territories, where rice husk or various kinds of rubbish are used for fuel. This again involves additional expense and temperature cannot easily be controlled. There is no doubt that, as oil becomes available in the tropics, oil-burning equipment will prove to be the most suitable.

An important consideration is whether even such simple machines as farm-type driers could be safely operated with the low-grade labour existing in most Colonial territories. While this can only be decided by experience, it should be remembered that fumigants are potentially far more lethal than grain driers, but their use has not yet resulted in the death of a single labourer in either Kenya or Tanganyika.

### Risk of moisture reabsorption

Some people are reluctant to spend money on drying grain, particularly if the climate is a damp one, because they fear that moisture will again be taken up in subsequent storage. If grain is stored in bulk, however, or in tightly stacked sacks, the rate of uptake of moisture is negligible and the grain, once dry, will remain so indefinitely.

The floor of the average 'godown' or shed is the principal source of moisture taken up by stored grain. The usual method of preventing this trouble is to incorporate a water vapour-proof barrier in the construction of the godown floor. For this purpose a bituminous compound, such as asphalt, is usually laid on top of

**A Blanch grain drier at Kisumu on Lake Victoria. In this machine the grain descends over a series of sloping, louvred trays under the control of revolving baffles, hot air being blown through the louvres**

the floor. A cheaper but less permanent method, if the floor will not be used by wheeled vehicles, is to cover it with sheets of roofing felt. Some firms make special flooring grades of this material for floor covering.

### Alternative methods of grain drying

Because driers are expensive, there is a considerable demand for other methods of drying grain. Bin drying uses a relatively small temperature rise, the rate of drying being correspondingly lower. It has the great advantage of requiring practically no labour or supervision. In the simplest form of this process warm air is blown into the bottom of a shallow storage bin full of grain and allowed to escape at the top. Theoretical considerations suggest that bin drying could be especially suitable for hot and damp climates. The amount of heat that can be used is limited by the risk of over-drying the grain, but the hotter and more humid the atmosphere the greater the amount of heat that can be added to the air without danger of over-drying, and hence the greater the potential output for a given plant.

In general, it is sound policy to buy the most modern types of drier, although the cost may be a little higher, and advice should be sought from specialists.

*This article has been prepared after consultation with members of the staff of the Pest Disinfestation Laboratory.*

*Photos: Pest Infestation Laboratory, Crown Copyright*

## *Crops in the Sudan*

The following report on the condition of crops in the Sudan has been received from the Sudan Ministry of Agriculture:

The general picture continues good. Cold weather in early November checked some cotton, but most of the crop is growing well. The incidence of pests and disease is fortunately low.

*Cotton.* The areas planted by varieties in the Gezira irrigated area are:

| | *Feddans* |
|---|---|
| Domains Sakel .. .. | 119,239½ |
| X1730A .. .. .. | 103,912½ |
| X1730L (1) .. .. | 11,815 |
| | 234,967 |

Preliminary cotton crop estimates are 5 large kantars (312 lb.) of seed cotton per feddan.

In the White Nile Schemes Board areas Abdel Magid (9,980 feddans of cotton) suffered slight boll shedding from ' asal,' stickiness caused by aphis; first estimates are 4½ large kantars. On the W.N.S.B. pump schemes ' asal ' and whitefly are prevalent, but the cotton looks well and 5½ kantars are forecast.

Private schemes on the White and Blue Niles have 54,300 feddans of cotton; first estimates are a total of some 236,000 large kantars. In the Fung cotton was late sown and in Dueim district aphis are troublesome on some schemes. In all areas, however, cotton is flowering and bolling well.

In the Gash Delta 53,644 feddans were established on flush irrigation; 25,056 feddans are in Domains Sakel and almost all the rest in X1730 varieties. The cotton is generally healthy and growing well; the late-sown cotton (Sakel) has made a good recovery from grasshopper attacks. Sudan bollworm, aphis and leafcurl are present, bollworm is not yet as serious as last year, but remains a threat. 80,000 large kantars are provisionally forecast as the crop.

Fierce hababai winds continued to ravage the Tokar Delta X1730A cotton and reduced the original area of 124,000 feddans of cotton and grain sown to 68,000 feddans, 58,000 being in grain. The first provisional estimate of the cotton crop is 200,000 small kantars (100 lb.). Pests are few and cool weather and winter rains may bring a different picture.

Picking and marketing are in full swing in the Nuba Mountains area and the crop of Bar 7/8-1 American type cotton is estimated at 643,000 small kantars. The quantity and quality of the American type cotton grown in Zande districts in Equatoria are much improved over the 1952-53 season; 63,000 small kantars are forecast from 19,400 feddans.

*Sorghum.* The forecasts of heavy 'dura' production have generally been fulfilled. In some areas of the western and southern Sudan crops have been below average, but elsewhere the harvest was heavy.

Practically all rainland areas have averaged 2 standard ardebs (670 lb.) per feddan and yields have ranged up to 3 standard ardebs (1,000 lb.) per feddan. The irrigated ' feterita ' duras harvested at some 3½ standard ardebs (1,180 lb.) and the later-maturing irrigated duras at some 5 standard ardebs (1,580 lb. per feddan). The 117,400 feddans of dura in the Gezira irrigated area produced 73,000 tons of grain and Blue Nile Province alone has a saleable surplus of some 100,000 tons.

*Sesame.* The Gedaref district of Kassala Province had a record crop. The new seed was fetching LE.1.800m/ms per kantar (99 lb.) in Gedaref market in early December.

*Other crops.* In Northern Province wheat sowings are reported down on last season, when the subsequent crop was poor due to rust and an unfavourable winter, but chick, pea and haricot bean sown on riverain flood lands are growing well. In Kordofan the water-melon crop, whose seeds are a valuable minor export, has so far escaped the pests which ruined it in 1952-53 and promises well.

# Sugar Cane Breeding in Australia

L. T. SARDONE

*As in many other sugar producing countries the production of new seedling canes has made considerable strides in Australia of recent years. It is largely the cultivation of new hybrid seedlings which is responsible for the recent considerable rise in Australian sugar production. The position in this connection is described below.*

AUSTRALIAN sugar mills will, it is estimated, have produced a record 1,230,000 tons of raw sugar for the year 1953, an increase of 30% on the 1952 output of 916,600 tons. Increased production has been due, amongst other things, to the growing of Australian-bred disease-resisting and sugar-rich canes. At the turn of the century Australian canefields yielded around 1½ tons of sugar to the acre; today they are yielding more than 3½ tons.

The characteristics required of a cane by growers are a high yield of sugar per acre, resistance to pests and diseases and suitability to the growers' particular geographical environment.

The object of cane breeding is to combine certain desirable qualities in a single variety. These include resistance to disease and adverse growing conditions, vigour, ease of cultivation and harvesting, higher sugar content and ease of mill treatment. Various combinations of qualities are required for different districts and conditions.

The varieties which were grown on the early Australian plantations have all disappeared. Many were too low in sugar content to be economical; others succumbed to disease or were unsuited to local conditions.

### History

In the early days imported canes were all commercial varieties from other cane-growing countries. In 1892 and 1896, however, expeditions sponsored by the Queensland Government went to New Guinea to collect native sugar canes growing there. The second expedition brought back the Badila, which for many years was the principal Queensland variety, and is still an important one. Four later expeditions have brought back other New Guinea canes.

Seedling canes were first raised in Australia by the Queensland Acclimatisation Society. Breeding was not conducted scientifically, fuzz, which contained the seed, being collected and planted from canes which arrowed in the field. A few hundred tons of one of these seedlings, known as Q813, is still grown, while this variety has also been used in the breeding of some later successful canes.

### The work of the C.S.R.

Cane breeding was commenced in 1899 by the Colonial Sugar Refining Co. Ltd. (C.S.R.) at a field experiment station at Hambledon, near Cairns, North Queensland, and continued till 1907. Some useful canes were bred there, the best known being HQ409 and HQ426 (Clark's Seedling). The latter is still grown today, but not extensively, as it has been superseded by improved varieties.

In 1925 the C.S.R. commenced seedling raising at the Macknade Field Experiment Station near Ingham, North Queensland. Notable varieties bred at Macknade include Trojan and Pindar. They are particularly suitable for the Ingham district, but are grown widely from Townsville northwards. Trojan is also the principal cane of the Burdekin district and the two varieties comprised about 38% of the 1952 Queensland cane harvest.

**A cane breeder cross-pollinating the flowers of different cane varieties**

### The work of the Bureau of Sugar Experiment Stations

The Bureau of Sugar Experiment Stations began breeding canes in 1927 at South Johnstone, near Innisfail, North Queensland. Some of its early 'SJ' canes are still grown commercially in small quantities.

The Bureau's cane-breeding work has expanded greatly and is now one of its most important activities. At Meringa, near Cairns, it raises 30,000 seedlings a year. Canes bred by the Bureau have been particularly successful in the central Queensland sugar district, the Mackay and Proserpine area. Q28 was widely grown in this area from 1945 to 1949 and, when it proved susceptible to ratoon stunting disease, Q50 was ready to take its place. It was second only to Trojan in the 1951 and 1952 seasons in total tonnage of cane crushed.

The efforts of local cane breeders over the past 20 years have quite changed the Australian sugar industry. In 1934 about 22% of the cane grown was Australian bred. This position did not alter greatly until 1943, since when a 'varietal revolution' has occurred. A number of good canes bred in the 1930s came into commercial production from 1943 onwards. In 1951 over 68% of the cane harvested in Queensland was Australian bred. In 1952 the proportion was 75.3% and it is expected to be even higher for 1953.

Both C.S.R. and the Bureau have contributed to these results. In recent seasons the proportions of the total crop represented by their canes were:

| | *C.S.R.* | *Bureau* |
|---|---|---|
| | % | % |
| 1949 .. .. | 29 | 30 |
| 1950 .. .. | 33 | 32 |
| 1951 .. .. | 38 | 30 |
| 1952 .. .. | 45 | 30 |

### Breeding new varieties

Cane is normally propagated by cutting a length of cane into small pieces, which are then planted. Thus the new cane plants are merely a continuation of the original plant and retain all its characteristics. Canes propagated in this way develop no new characteristics.

For breeding purposes new canes are raised from seed. The seed of sugar cane, like the seeds of all plants or the reproductive cells of animals, contains a number of chromosomes which, in turn, carry the genes, which transmit characters during the reproductive process. Sugar cane is

**Young plant cane in process of cultivation near Cairns, North Queensland**

itself hybrid and the number of possible combinations of the various genes is almost infinite. Very few of the seedlings resulting from a cross will have the combination of characters the cane breeder requires. In practice less than one commercial variety is obtained from 10,000 seedlings raised.

The cane breeder selects parents which he considers capable of transmitting certain desirable qualities. He crosses them and then selects those seedlings which show the special qualities he desires. In crossing the canes the pollen from the male flower falls on to the female flower, fertilising it.

Varieties which produce a large amount of fertile pollen are used as males. The females usually consist of varieties which are largely, if not wholly, male sterile; that is, they have little pollen. As the crossing season progresses varieties which are at first predominantly male often cease to produce fertile pollen and later in the season may be used as females.

## Breeding techniques

The two varieties selected for crossing are grown side by side in the field until they flower, the flower being termed an arrow. One method of crossing the desired parents is to take the top portion of two cane plants when in flower and to stand them together in earthenware pots containing a dilute solution of sulphurous and phosphoric acids.

A very still day is required for the anthers to shed their pollen. When the dew has dried off the flowers the pollen commences to fall and continues to do so for about an hour to an hour and a half. When all the female flowers have either been pollinated or have died the arrow is enclosed in a muslin bag, which allows sufficient light to penetrate for the seed to mature, but, at the same time, prevents it from being blown away.

Many varieties either do not arrow or do so sparsely; some varieties arrow early in the crossing season and others so late that the two types cannot be crossed. Some produce fertile pollen; others remain sterile. The mating of desired parents, therefore, is not always an easy matter.

**'Pindar' cane 16 months old growing in the Herbert River district of North Queensland. 'Pindar' is a successful new cane variety bred by C.S.R. and given free to cane farmers**

After the cross has been made the seeds take six or seven weeks to mature. They are then stripped from the stems of the arrow and sown directly on to the surface of specially prepared seed boxes. The spikelets, generally known as 'fuzz,' contain the cane seeds. The seeds are yellow-brown in colour and about $^{1}/_{25}$in. long. They are so small that no attempt is made to separate them from the fuzz for sowing.

Germination commences within 24 hours of sowing and is complete within four days. The seedlings are planted out in pots when about 2 in. high. They remain in these pots until they commence to stool and are then transplanted into the field. Four to five months elapse from the time the cross is made until the seedlings are planted out in the field.

A long period of testing follows. Many factors must be determined, including the yield of cane and of sugar, the ripening curve, ability to ratoon and to withstand adverse conditions such as drought and flood, cultivation requirements, resistance to disease and pests, ease of harvesting, and milling qualities. The determination of all these factors takes a long time. It is usually about 10 years from the time the cross is made until the variety is being cropped commercially.

## Australian-bred varieties:

The principal Australian - bred cane varieties crushed in 1952 were:

| *Trojan* | *Q*50 | *Pindar* | *Comus* | *Q*44 |
|---|---|---|---|---|
| 23% | 21% | 15% | 3% | 2% |
| *Q*28 | *SJ*16 | *Q*47 | *Eros* | *HQ*426 |
| 2% | 2% | 2% | 1% | 1% |

These constitute 72% of the total Australian crop, the remaining percentage mainly comprising:

| *Badila* | *CP*29/116 | *POJ*2878 |
|---|---|---|
| 13% | 10% | 1% |

*Photos : C.S.R.*

## *Clifford Aero Change*

The directors of Clifford Motor Components Ltd. have announced that Mr. Herbert Clark has joined the board of their subsidiary company—Clifford Aero & Auto Ltd.—and has taken over the position of managing director of that company. Mr. H. J. Stretton, the former managing director, resigned to take a position with Messrs. G. D. Peters & Co. Ltd., of Slough, as a director and general manager.

# Handling Bananas at the Port of Bristol

*The trade in banana imports into the United Kingdom largely takes place through the Port of Bristol. During the last war banana imports into Great Britain were prohibited to save tonnage and on the grounds that the fruit was wrongly regarded officially as a starchy food of low nutritive valve. The banana trade from Jamaica suffered severely, the damage being increased by the outbreak of leaf spot disease. Since then the trade from Jamaica has slowly revived while that from the Cameroons has greatly extended. The following account of the position is based upon material supplied by the Port of Bristol authorities and official publications.*

THE association of the port of Bristol with the banana trade dates back to 1901, when, on March 18 in that year, the R.M.S. *Port Morant*, a steamer of 2,831 tons, arrived at Avonmouth with 20,000 bunches of bananas loaded in Jamaica two weeks previously. From that time the association has remained unbroken, apart from the war years 1940 to 1945, when imports of bananas were banned from all sources and the fleet of specially designed banana-carrying steamers was called upon to take over more arduous war-time duties. Bristol came into the banana picture once more on December 30, 1945, when S.S. *Tilapa* entered the lock gates carrying the first full cargo of bananas to reach the shores of Britain for five years.

## Banana production in the British Commonwealth

Before the war the British Commonwealth was on balance a net exporter of bananas, exports from the British West Indies and British West Africa slightly exceeding imports into the United Kingdom and the Dominions. The largest exporter was Jamaica, which in 1938 exported 340,000 tons, of which 226,000 tons went to the United Kingdom. During the war exports were entirely suspended; since the war they have revived, but to only a fraction of their pre-war size. For the four years 1947-50 banana exports from Jamaica averaged 67,000 tons, in 1951 they fell to 53,000 tons as the result of the severe hurricane experienced in Jamaica in that year, but increased again in 1952, while for 1953 it is expected that exports will have amounted to 10 million stems, approximately half the pre-war total. A main contributory cause to the falling off of production in Jamaica has been the rapid spread of leaf spot disease.

Among Commonwealth sources the British Cameroons have made great strides as an exporter. Before the war exports amounted to 55,000 tons, most of which went to Germany. Since the war banana exports from the Cameroons have risen from 5,000 tons in 1946 to 20,000 tons in 1947 and 72,000 tons in 1952. Since the war small supplies have also reached the United Kingdom from Dominica, Sierra Leone and British Honduras, but latterly production from the last-named place has fallen to negligible proportions.

The foregoing brief survey shows three outstanding features: (*a*) the severe setback to production in Jamaica by the ban on exports of bananas during the war, (*b*) the serious effect on Jamaica's ability to recover her pre-war export position resulting from the spread of disease and (*c*) the spectacular rise in production in the British Cameroons. It seems certain that supplies from Jamaica will further increase, but she has a long way to go before she reaches the pre-war production. As to the Cameroons, reports from that country indicate that new plantations are making good progress and the expectation seems to be that further considerable increases in exports may be anticipated.

## The place of Bristol in the banana trade

It is now generally accepted that, while banana imports may not take front rank in Bristol trade from the tonnage point of view, they have been a leading and characteristic feature of it for many years and throughout the world Bristol is recognised as one of the world's leading banana handling ports. It is a source of satisfaction to those responsible that larger shipments of bananas are again reaching the port.

The port possesses special facilities for handling bananas. Messrs. Elders and Fyffes, the leading importers of bananas in the United Kingdom, have installed special facilities for handling the fruit, including four elevators and mechanical conveyors on the quayside at Avonmouth; these were, in fact, the first installation for mechanically handling bananas to be erected at any port in the world.

**Loading the stems of bananas into the pockets of the elevator belts in the hold of a banana vessel**

### Mode of handling banana cargoes

In discharging cargoes of bananas the fruit is man-handled in the ship's holds and each stem separately placed in one of the canvas pockets of an elevator. From the top of the elevator the fruit is fed on to a telescopic conveyor extending over the quay and then descends by a further elevator to the conveyor belts running along the covered quay. The stems are lifted off the belts and loaded direct into special type railway vans alongside, an uninterrupted flow of empty vans being assured by the layout of the railway lines. These special banana vans, before receiving the stems of fruit, are primed with straw placed on the floor and in the corners so as to give the fruit special protection during transit.

A good average rate of discharge is 1,500 stems per hour per elevator and, on the basis of four hatches working, a cargo of 120,000 stems can normally be cleared in approximately 20 working hours. At this rate of discharge approximately 30 to 35 vans are loaded each hour.

### Protection in cold weather

To safeguard the fruit in cold weather the vans are steam heated. Steam heating is carried out either before transit begins or during transit. The former method is employed when conditions are not severe and for consignments conveyed by booked services, when steam-heating facilities would not normally be available. It is also used for vans on ' specials ' which are proceeding a short distance before 'break-up.'

Steam heating in transit is carried out in severe weather when ' specials ' have a long run before reaching the point of break-up, for example, between Avonmouth and York. The disadvantage of steam heating in transit is that the load of ' specials ' has to be kept at a maximum of 30 vans to ensure sufficient steam reaching the rearmost van.

### Distribution to consignees

Consignments of bananas are normally available to consignees at destination on the morning of the day following despatch. The assistance given by the railways staff in effecting transit for this perishable traffic is much appreciated by the authorities and affords a striking example of complete co-operation between the users and the providers of railway transport.

### Ripening the fruit

Upon arrival at the destination station the fruit is off-loaded by the consignees and conveyed by road transport to the ripening depots. In many instances consignees have rail-served depots, which enable the fruit to be housed more quickly and reduce the number of handlings. The fruit, which should still be hard green, is hung in insulated ripening rooms and by means of controlled heating the ripening process takes place in four to five days, when the fruit changes in colour from green to a golden yellow.

**The elevator pockets come up from the holds of the vessel, taking the bananas to the vans on the quayside**

At this stage the ' hands ' are cut from the stems and the fruit is packed in wooden boxes lined with straw or paper to afford protection against cold. The boxes are loaded to motor delivery vehicles for the final stage of the journey to the retail shop.

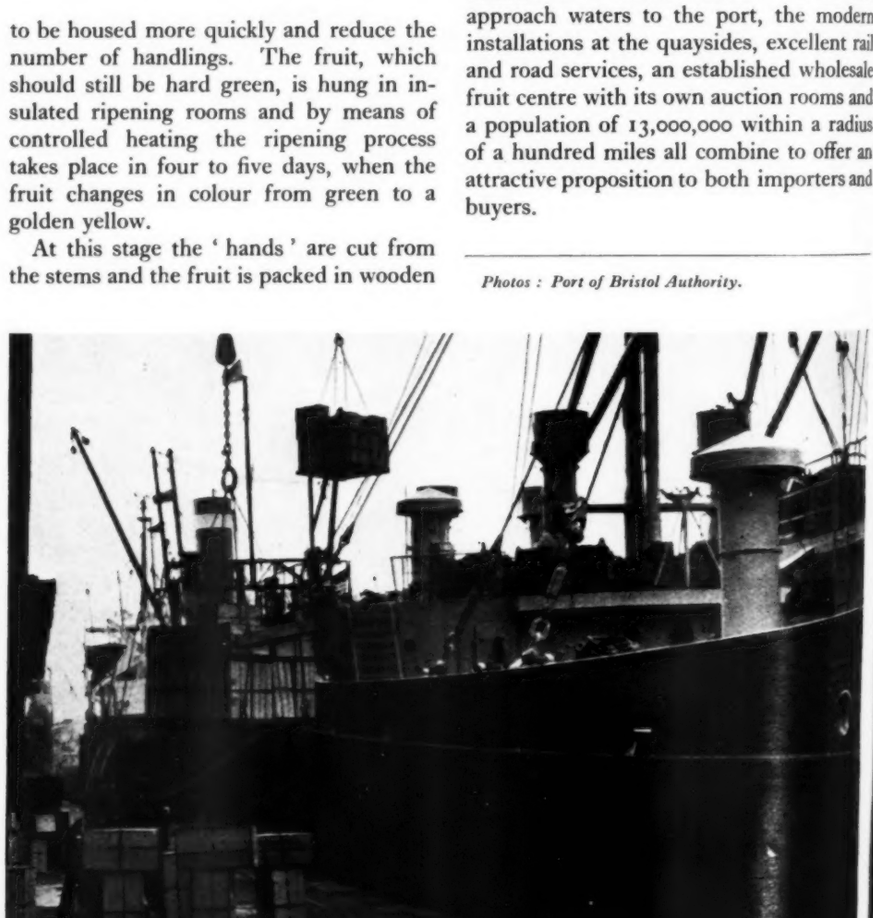
This completes the journey made by the banana. It has travelled some 4,000 miles from the tropics to a temperate climate and has made this journey entirely unprotected by any form of packing, representing a triumph of transport organisation and co-operation of all concerned.

### Conclusion

The importation of bananas in such large quantities has tended to overshadow the importance of other fresh fruits, including citrus fruit. However, the port of Bristol handles an average of 15,000 tons of citrus fruits each year, including 12,000 tons of oranges from Israel, the Lebanon, Cyprus and Spain. The remaining tonnages include grapefruit from the West Indies and lemons from Italy and Sicily.

As a reception point for imported fruit, Bristol is in a particularly favourable position to serve the densely populated Midlands, the Southern and South-Western counties and South Wales. The safe approach waters to the port, the modern installations at the quaysides, excellent rail and road services, an established wholesale fruit centre with its own auction rooms and a population of 13,000,000 within a radius of a hundred miles all combine to offer an attractive proposition to both importers and buyers.

*Photos : Port of Bristol Authority.*



**Discharging oranges to the quay at Avonmouth Docks**

# The Desert Locust

*We have published many references to the locust situation in* WORLD CROPS *and the position in this regard will be known to many of our readers. Of recent years, however, despite the efforts to control the plague being made through the International Locust Control Organisation and FAO, a very serious threat to agriculture in the whole of Northern and Central Africa and the regions of the Middle East has arisen from the desert locust* (Schistocera gregaria) *originating from breeding centres in Arabia, Iraq and Iran. In the first of the following two articles the general situation is reviewed by Mr. O. B. Lean, while in the second an account is given of a new technique of spraying flying locust swarms from the air which has been developed recently in connection with the desert locust campaign.*

## 1 – The Desert Locust Situation

**O. B. LEAN**

*Expanded Technical Assistance Programme, Agriculture Division, FAO*

SINCE an earlier account on the desert locust situation up to September, 1952 was published* the plague has continued with varying intensity through the invasion zone from India to the Atlantic coast of West Africa and from Turkey to Tanganyika. During this period intensified efforts were made to control the desert locust; campaign organisations were strengthened, new techniques developed and countries worked increasingly together in planning for concerted action and in providing mutual assistance.

Although these improved measures succeeded in checking the plague sufficiently to avoid extensive crop damage, they did not prevent a general expansion of the plague which in November, 1953 was more widespread and potentially more dangerous than at the corresponding period in 1952. The following list of territories affected by the desert locust in October and November, 1953 indicates how extensive the plague has become:

| | |
|---|---|
| Aden Protectorate | Kuwait |
| Algeria | Mauretania |
| British Somaliland | Nigeria |
| Egypt | Oman |
| Ethiopia | Pakistan |
| French Cameroons | Saudi Arabia |
| French Morocco | Senegal |
| French Niger | Somalia |
| French Sudan | Spanish Sahara |
| India | Sudan |
| Iran | Syria |
| Iraq | Tanganyika |
| Israel | Tchad |
| Jordan | Tunisia |
| Kenya | Yemen |

*Lean, O. B. 'The Desert Locust Situation.' FAO Plant Prot. Bull. 1. 2-4, 1952.

### Spread of the plague

In the Eastern Region the extensive 1952 monsoon breeding in India and Pakistan, though largely controlled, produced a number of swarms which migrated into Iran, Oman and Saudi Arabia. Some of these, moving up the Persian Gulf, reached Kuwait in October and later spread to Jordan. Other swarms, possibly of the same origin, arrived in the Aden Protectorate and Yemen in November. Some crossed to Africa. The further spread of swarms of this generation, reinforced by swarms derived from uncontrolled breeding in Yemen, resulted in widespread spring breeding in Arabia, southern Iraq, Jordan and southern Iran.

During the autumn of 1952, while these swarms from the eastern monsoon breeding areas overspread the Near East, other swarms which had remained in eastern Africa bred in the Somali Peninsula (British Somaliland, northern Somalia and south-eastern Ethiopia). Benefiting from the experience of 1951-52, when the progeny of corresponding short rains breeding in that area escaped to Arabia to breed, after a spectacular migration, throughout the Near East, control forces were heavily reinforced. In Somalia the Italian Trusteeship authorities killed 35,000 hopper bands; the British Desert Locust Control units destroyed almost the entire hopper infestation over an area of 24,000 square miles in British Somaliland and, with the help of an air spraying unit provided by the United States Point Four Programme, cleaned up a similar area in Ethiopia. As a result only a few small swarms migrated into British East Africa, some remnants reaching Tanganyika.

The 1953 spring breeding in Arabia occurred over large areas across the peninsula, with hatching commencing in January along the southern Red Sea coast and in Oman, and spreading gradually northwards until April. The infestation continued through Israel, Jordan, Syria and Iraq to south east Turkey, which was invaded for the first time since 1945. In all these countries intensive hopper campaigns prevented any appreciable escapes.

The spring hopper infestation in Iran, resulting from parent swarms arriving direct from India and Pakistan and through Arabia, affected most of the southern half of the country and was particularly intense in Khuzistan. The campaign began in February and continued to the end of July. Operations were conducted over an area of a million hectares at a cost to Iran of U.S. $600,000. About 10% of this area was treated by aircraft; 6,600 tons of poison bait and 4,500 gal. of aldrin were expended. FAO provided 3,000 gal. of the aldrin and some BHC to the value of U.S. $35,000.

Completing the annual cycle in the Eastern Zone, Pakistan and then India were reinvaded from the west in May, 1953 probably mainly by swarms escaping from Iran and Oman. The monsoon breeding which began in July and continued until the end of September was lighter than in 1952, but swarms escaped to migrate westwards back to Iran, where many swarms arrived in November, and perhaps to Arabia.

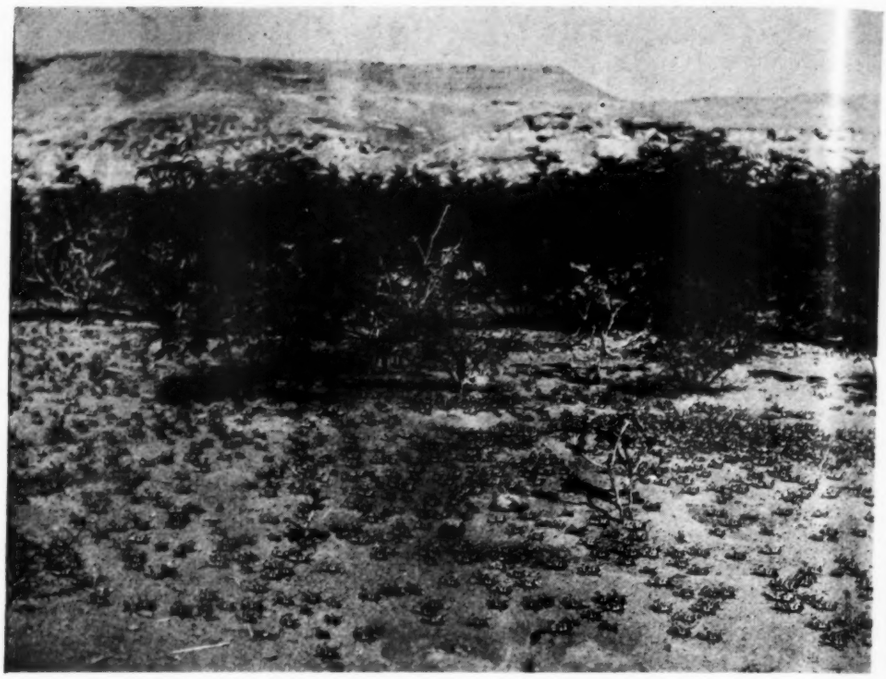
Whereas the locust situation in the east became, at least temporarily, more favourable, that in south-western Arabia and the Somali Peninsula deteriorated, and in November and December, 1953 was prob-

ably more critical than at any time during the present plague.

The infestation in the Somali Peninsula is particularly dangerous. Breeding began in October, 1953 over vast areas, including almost all Somalia, southern British Somaliland, adjoining areas of Ethiopia and north-eastern Kenya. All available forces were mustered to deal with the emergency and by the end of November 70,000 hopper bands had been destroyed in Ethiopian Ogaden alone.

From August to October heavy breeding took place in Yemen and adjacent coastal areas of Saudi Arabia, and, although control work was extended in Yemen, mass escapes began to fly out northwards in October. Some of these appear to have migrated rapidly across Arabia, invading Jordan, Israel, Syria and Iraq in November; the majority will, however, remain to breed in Saudi Arabia.

A feature of the year was the build-up of the desert locust plague in the Western Region, due in part to infiltration from the east. In the autumn of 1952 isolated swarms were reported from the Sudan and Tchad and later in Niger Colony and French Sudan. During the summer of 1953 the infestation became more general and swarms reached the Atlantic coast of Mauretania in July. In October a considerable number of swarms invaded French Morocco and in November Algeria and Tunisia. This movement is likely to result in widespread spring breeding in North Africa from Morocco to Libya.



[*Photo: Shell Co*

**Fourth and fifth stage hoppers on an island in the Tigris River in the Mosul area, Iraq**

### International action

A sequence of control campaigns has continued without intermission throughout the period under review. The foregoing summary of the spread of the plague indicates the intricate pattern of the migrations and emphasises how the locust attacks in all regions are interrelated, and how each campaign is an integral part of the collective effort to stem the plague. FAO aims at an overall appraisal in order to stimulate co-operative counter-measures.

By its provision of vehicles, anti-locust equipment and insecticides from the reserves built up in 1952, FAO contributed directly to the success of several campaigns, particularly those in Pakistan, Iran, Iraq, Jordan, Saudi Arabia, British Somaliland and Ethiopia. Concurrently, through instruction in air spraying techniques and by large-scale field operations, the United States Foreign Operations Administration gave strong support to the national campaigns in India, Pakistan, Iran, Iraq and Ethiopia. The practical benefit of assistance exchanged between the threatened countries was an outstanding feature of the 1952 campaigns. This policy extended in 1953 and further expansion is in view.

As a result of an emergency meeting convened by the Government of Jordan in March, 1953 to devise plans for joint action, Lebanon, Saudi Arabia, Syria, Turkey, the United Kingdom and FAO contributed to the campaign in Jordan and adjacent areas of Saudi Arabia, the total cost of which was estimated at U.S. $364,000. The foreign assistance included personnel, 38 vehicles, 800 tons of bran and 37 tons of BHC.

During the same period Iran also received considerable help, which included 13 aircraft with pilots, 1,100 tons of bran, 106 tons of BHC, 46 tons of aldrin and 24 vehicles, contributed by India, Pakistan, Turkey, U.S.S.R., U.S.A. and FAO. The Government of the United States also provided $61,000 for the purchase of additional vehicles and insecticides. Neither Jordan nor Iran could have achieved success without assistance and the neighbouring countries, by their participation, gained relief from intensified attacks.

At a meeting convened by FAO at Damascus in November, 1953 attention was focused on extending international co-operation within the Arabian Peninsula. This meeting, attended by representatives from 15 countries which are all liable to invasion by swarms derived from uncontrolled breeding in Arabia, agreed that the intensified efforts required to control the forthcoming spring breeding could be achieved only by concerted international action and recommended that such action should be co-ordinated by FAO.

Most of the countries represented indicated their willingness to contribute either control teams or equipment. The urgent problem of how and to what extent the recommendations might be translated into practical action was further discussed at the seventh session of the FAO conference in Rome, November-December, 1953. The conference gave wholehearted support to the project and by authorising the expenditure of U.S. $150,000 from the 1954 budget to match the direct contributions from countries FAO is enabled to take an active part in the campaign. FAO's contribution will serve to meet the high running costs of the campaign, including such items as labour, petrol and transport, without which the international teams would be unable to operate. The action taken at the Damascus meeting and the FAO conference marks an important step towards increased international action and exemplifies the modern approach to the desert locust problem.

### Development of control techniques

Locust control techniques are under constand review. In the drive for greater efficiency new methods are being evolved, particularly to speed up application and to economise material. During the past few years dry poison bait has almost entirely supplanted moist bait. Low-volume

sprayers are finding increased uses; the role of aircraft is extending.

The aerial application of aldrin against the desert locust was introduced by United States experts during 1951 in Iran. Subsequently this technique has become established in support of ground operations against hopper bands, and very large areas have been treated. Several countries are developing their own aerial units with pilots trained by the United States Point Four experts.

Attention is also being directed to the use of aircraft for air-to-air operations against flying locust swarms. To assist in the practical evaluation of this technique FAO placed four spraying aircraft at the disposal of Desert Locust Control. During the last two months these aircraft applied seven tons of concentrated insecticide on flying swarms and, to quote one example illustrating the potentialities of this technique, one swarm covering 30 square miles when in flight and so dense that it could be seen from a distance of 60 miles, was destroyed by the application of only 320 gal. of insecticide.

(*FAO Plant Protection Bulletin.*)

# 2—Some Developments in the Use of Aircraft Against Flying Locust Swarms

**R. C. RAINEY and H. J. SAYER**

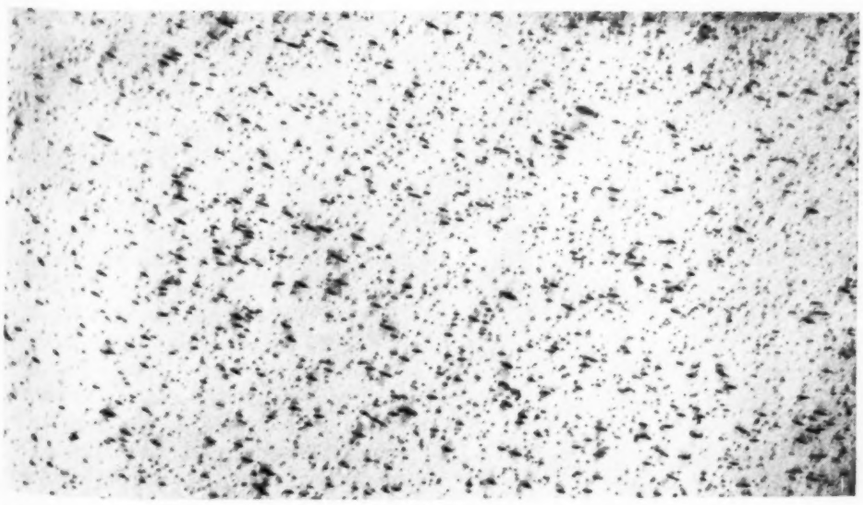
*Desert Locust Survey*

STANDARD methods of locust control against hoppers are applicable during only a small proportion of the total length of life of the locusts. The need for a method of attacking flying swarms has long been realised; experience in Pakistan was reported by Dr. Taskhir Ahmed at the FAO Advisory Committee's meeting in November last; and laboratory and field research direct to this end has been in progress under the auspices of the Anti-Locust Research Centre for a number of years past. By 1947, a 20% DNC-in-oil spray developed for this purpose has been found effective in operations with Anson aircraft against settled red locust swarms in Tanganyika; complete mortalities were obtained at a dosage of slightly over 1 gal. per acre of swarm.

During 1949 and 1950 the desert locust plague flared up again, and the mobility of the swarm of this species (which have not infrequently been known to breed more than a thousand miles from the area in which they had developed as hoppers) has been such that opportunities for utilising large ground machines against settled adults of this species in the manner in which such machines are regularly and effectively used against red locust in its outbreak areas have been rare indeed. Moreover, recent experience in India has further emphasised the inevitable limitations of techniques of aircraft operation dependent on ground parties for scouting and demarcation, whether against hoppers or swarms.

## Wind tunnel studies

Wind tunnel studies on spray pick-up by flying locusts under controlled conditions at the Chemical Defence Experimental Establishment, Porton, subsequently demonstrated that the locusts were still more susceptible to this spray in flight than when settled, and, following preliminary aircraft observations in 1951 on certain relevant aspects of swarm behaviour, airspray trials against flying swarms of the desert locust in Kenya were resumed on a small scale in 1952.



**A swarm of locusts as seen from the ground**

## Trials on flying swarms

The scope of these trials was further limited by a shortage of swarms, but during February 7 to 15, 1952 some 890 gal. of insecticide were applied to four immature flying swarms in the Northern Frontier Province in 21 sorties by a single Auster 'Aiglet' spraying aircraft (48-gal. spray load) without ground scouting or demarcation. One small swarm initially a mile long in flight and covering an area of 300 to 400 acres when densely settled, was almost completely destroyed by the application of 340 gal. of DNC in nine operations.

Throughout the period of operations the swarms concerned travelled consistently down wind, on all four occasions on which both upper-wind observations and accurate successive swarm fixes were available; swarm track was within 1° to 8° of directly down the corresponding vectorial mean wind between the ground and the level of the highest locusts. The down-wind movement, previously shown to be a general characteristic of major long-distance swarm displacements, was thus also true in detail for the hour-to-hour swarm movements recorded during these trials. It was accordingly found possible to use the local early morning pilot balloon observations to determine the sector to be searched for incoming swarms, and every swarm was, in fact, first located by systematic air search while still approaching base, giving ample opportunities for repeated spraying operations.

## Advantages of the method

Such repeated attacks by highly manoeuvrable light spraying aircraft have several advantages over corresponding

single operations by larger aircraft, particularly against swarms of the complex structure seen in these trials. Wastage of spray, both by overdosing and by missing locusts altogether, is more easily avoided with the light aircraft, with which the task of the spray pilot is simpler and expert direction accordingly less necessary. An important further advantage of the type of aircraft used was that the cooling system of the inverted in-line engine proved particularly well adapted to deal with incoming locusts which accumulated harmlessly at the back of the air-scoop. Serious difficulties in this respect have been experienced in the past with, for example, radial engines. The carburettor air intake and oil cooler were adequately protected by specially fitted wire grilles.

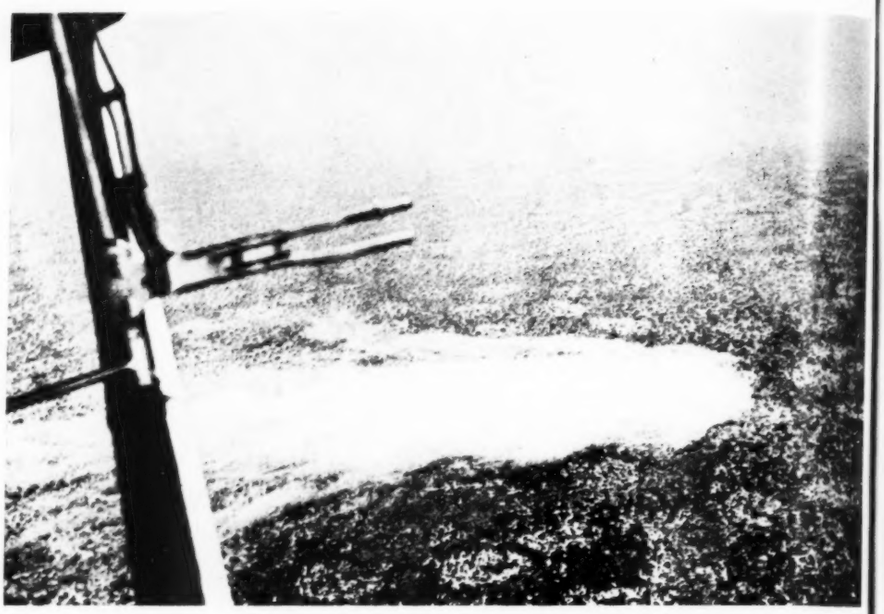
### Ground speed of the swarms

The ground speed of the swarms was very low (1 to 7 m.p.h.) as a result of the intermittent nature of the flight of the individual locusts and were substantially less than the corresponding wind speeds (7 to 21 m.p.h.). In such circumstances the original 'aerial curtain' technique—making successive spray runs between fixed air positions across the heading of the locusts —was clearly inapplicable, since practically the whole of the spray applied in this manner would reach the ground far in advance of the swarm. The alternative 'static curtain' produced by spray runs applied between fixed ground positions, initially ahead of the swarm, would clearly also waste most of the spray applied in the first few runs. Furthermore, with these low ground speeds a static curtain would need to be maintained for an excessively long time for the whole swarm to pass through it.

Fortunately, this type of swarm behaviour (movement down wind at a ground speed well below the wind speed) had been encountered and studied during the preliminary aircraft observations in 1951, and it had been decided that such swarms should be attacked by drift spraying, using the flying locusts for demarcation, but, in fact, treating the temporarily settled locusts beneath, which probably represent the greater part of such swarms, as the primary target.

### Mortality

No rigorous assessment of mortality was possible, owing to the terrain (dry woodland with thorn bush) and to the distance covered by the swarm during these operations (49 miles), but there was reason to believe that the survivors which were, in fact, seen did not amount to 0.1% of the original swarm. A detailed analysis of the field result obtained in relation to laboratory data on the pick-up and toxicity of the spray to flying locusts, using recently developed graphical methods of applying such data to field conditions, indicated modifications in drop-spectrum and spraying tactics likely considerably to increase efficiency.



**A locust swarm as seen from the air. This particular swarm was sighted 40 miles away and covered some 300 acres**

Further trials along these lines were undertaken the following season and between December 30, 1952 and January 31, 1953 3,045 gal. of concentrated insecticide (2,995 gal. of 20% DNC and 50 gal. of 11% BHC) were applied to 14 small immature and maturing swarms in flight during 93 sorties (totalling 97 hours' flying) by two Auster J5G spraying aircraft (70-gal. spray tank) operating from four successive bases extending over some 400 miles across Kenya with the assistance of a third Auster, an 'Autocrat,' for observation and reconnaissance (representing a further 94 hours' flying), but again without ground parties for scouting or demarcation. The total cost of the chartering of three aircraft (terminal charges overhead and flying charges over the whole period December 1, 1952 to February 14, 1953 including 179 hours' additional experimental, reconnaissance and communications flying) was £4,419, to which should be added £1,565 in respect of insecticide used and £2,622 in respect of the total ground expenses of the unit over this period.

### Results

The results confirmed and amplified those of the previous season. Repeated air observations were made on four of the spray swarms, each initially covering 300 to 500 acres in flight and visible up to 40 miles away, and demonstrated the striking effects of spray rates totalling about 1 gal. DNC per acre of flying swarms; all four swarms were reduced to small groups of survivors, found only with considerable difficulty and no longer worth spraying. The net cost of destruction of each of these swarms (flying, insecticide and ground expenses over the period from the reconnaissance which first located the swarm until the final spraying sortie against it) ranged from £356 to £465; these figures provide an indication of the level to which total costs might have been expected to fall with continuous utilisation of the aircraft.

Circumstances exceptionally favourable for ground assessment on one occasion made possible for the first time a direct assessment of the total kill resulting from a single-spray operation of this nature. Thus, following the application of 50 gal. of 11% BHC to a low-flying maturing swarm between 1650 and 1720 hours on January 27, 1953 over open ranching country in the Kenya highlands, the swarm settled for the night only two-thirds of a mile beyond the spray site and the survivors did not move off until shortly before noon the following day. Practically the entire kill resulting from this operation accordingly took place within the 200 acres of the roosting site instead of being scattered along many miles of swarm track, as in the case of all previous operations. Counts at 101 sampling points of 1 sq. yd. each, located to provide a valid

(*continued on page 163*)

# Methyl Bromide as a Fumigant in Cargo Ships

*For the control of pest infestation in foodstuffs and stored produce in warehouses and ships' holds fumigation is the recognised remedy. Of late years methyl bromide has steadily gained favour as a fumigant in preference to hydrogen cyanide by reason of the enhanced safety attending its use.*

MUCH has been written concerning the preservation of world food supplies which can be achieved by reduction of loss due to the attack of pests. It is especially wasteful to lose crops after time, labour and money have been expended on their production and harvesting. Storage disinfestation and protective treatment are increasingly recognised and applied for the preservation of foodstuffs in store, but there is an equal need for cleanliness in the ships which carry the goods between countries. In the United Kingdom national life depends largely upon imported raw materials and food and on cargo shipments, so the care and cleanliness with which foodstuffs are handled are very important.

When bulk foodstuffs are unloaded from a ship's hold it is inevitable that some residues remain lodged in crevices and provide subsistence for pests until such time as they are supplied with abundant food by a new cargo. These sites of pest habitation, especially the spaces beneath the hold flooring, behind boarding, between boards and within the bilges, are inaccessible to liquids and the only effective weapon is the vapour of a fumigant. Fumigation is, in fact, generally accepted as the most efficient method of controlling pests in confined and difficult spaces, even in ships where alternative accommodation for the crew has to be found during the process.

## Advantages of methyl bromide as a fumigant

For many years hydrogen cyanide was considered a satisfactory fumigant for ships' holds. It has been employed in various countries for 'deratisation' and also at higher dosages against insect pests. In recent years, however, attention has been focused upon methyl bromide, which has certain advantages in ship fumigation and in the treatment of foodstuffs and other commodities ashore. Methyl bromide is now extensively used as a fumigant for foodstuffs in depots and warehouses, but up to the present it is used in the holds of cargo ships only to a limited extent. It was first introduced for this purpose in June, 1948 in Canada, where the port disinfestation authorities undertook comprehensive investigations of methyl bromide and hydrogen cyanide, since the disadvantages of hydrogen cyanide stressed the need for an alternative fumigant.

It is known that appreciable amounts of hydrogen cyanide are readily held in temporary physical sorption upon commodities, containers and structural materials, so that the characteristic odour of the gas persists after fumigation and aeration has been completed. This persistent odour has serious repercussions on labour, and fear of the odour has caused stevedores and other workers to refuse to continue work in ships' holds, despite assurances that the concentrations present were well below those toxic to humans. Therefore, in this respect, the lack of odour of methyl bromide makes it a good substitute for hydrogen cyanide; but this characteristic devolves a great responsibility on the fumigator, who must be very conscientious in making tests before declaring that the area is fit for human entry after aeration.

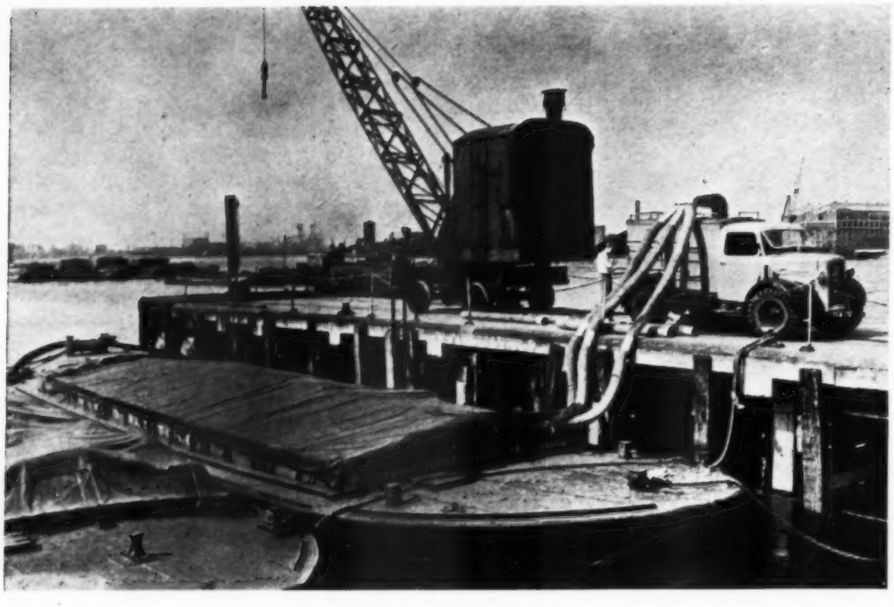
## Characteristics of methyl bromide

Methyl bromide is relatively inert chemically and is only slightly liable to surface sorption physically. It has markedly greater powers of penetration and speed of entry and exit than hydrogen cyanide, which may be physically adsorbed before reaching the utmost infested recesses, which *must* be reached. The negligible solubility of methyl bromide in water avoids the difficulty experienced with very soluble hydrogen cyanide, which may be significantly absorbed in wet or damp holds and constitute an embarrassment and perhaps a serious hazard after fumigation.

## Results of comparative tests

Comparative tests were carried out in Canada on the insecticidal properties of the two fumigants. Thirteen species of insects, comprising weevils, moths and beetles, are commonly found in sea-going vessels and economically warrant control. From these the granary weevil—*Sitophilus granarius* (*Calandra granaria*) (L) and *Cadelle* (meal worm)—*Tenebroides mauritanicus* (L), were selected as being suitable for laboratory and natural tests. These showed that methyl bromide was significantly more effective against the weevil in all stages of its development,

**Sacks of grain being covered with gas-proof tarpaulin before fumigation**



**Millwall Dock: aeration of barge after fumigation, blowing out operation**

under summer conditions at Montreal and against all stages except the first instar in winter at Vancouver.

These experiments have led to increasing use of methyl bromide in the holds of grain ships at Canadian ports. However, many vulnerable goods passing in and out of other countries present their own infestation problems. At British ports, for example, many thousands of tons of dried fruits, packed in wooden or fibreboard boxes, have been fumigated with methyl bromide. This work is expeditiously and conveniently carried out in barges. An advantage of methyl bromide is that it does not form poisonous residual compounds with the sugars of dried fruit, an unfavourable property of hydrogen cyanide, while it has been demonstrated that, when necessary, cheese, butter and dehydrated milk can be successfully fumigated with methyl bromide without their flavour being affected.

## Other uses

Plant quarantine fumigation in numerous countries is now being carried out increasingly with methyl bromide without injury to living plant material. It has been found that seed-borne eelworm can be eliminated from clover and other seed without loss of germination by this means. Recent Australian work has also established that sawn softwood timber up to 4 in. thick is completely penetrated by methyl bromide in 24 hours at atmospheric pressure and that this treatment applied in ships' holds can be relied upon to destroy wood-infesting insects in close-packed boards. It has also been shown that some hardwoods can be disinfested with equal success and that fungal parasites of wood are also susceptible to the gas.

Methyl bromide is effective against a wide range of insect pests in all stages of development and is reliable even at relatively low temperatures. Rodents are destroyed by dosage rates below those required for insects and the fumigant is highly toxic to all the non-specific pests found in ships, such as cockroaches, silverfish and the like.

**Cylinders of methyl bromide being connected to thin, vertical entry tube during silo fumigation at Barking**

## Methods of application

Since the gas is three and a quarter times heavier than air, it tends, initially, to settle at the bottom of spaces fumigated. The Canadian investigators found, however, that with the aid of small fans concentrations are evenly distributed and with half an hour's circulation the methyl bromide does not thereafter layer out. Similarly, in the subsequent aeration of a chamber or hold the use of a blower facilitates the process. The holds are, of course, made gas-tight by the usual procedure.

Gaseous fumigants are, of course, usually toxic to man and require care in use, and methyl bromide is no exception. In Britain emphasis is laid on its application from outside the space treated so that protective clothing and other equipment would be primarily for emergency use. It is usual to apply the fumigant through spray nozzles on a copper or other suitable pipeline from a cylinder of liquid under pressure (up to 80 lb. p.s.i.). Accidental splashes on the skin must be washed off at once to prevent blistering. The maximum concentration considered safe for prolonged exposure is 17 parts per million by volume in air; it is readily indicated by colour in the flame of the halide leak-detector lamp. Sometimes lachrymatory warning gas, chloropicrin, is added (2%) and this mixture is extensively used in Britain, but this does not impair the property of a non-persistent odour. The chloropicrin gives warning of gross leakage and the detector lamps are used mainly to determine safety for human entry into treated spaces.

## Conclusion

The foregoing indicates the exceptional value of methyl bromide as a fumigant for ships' holds. Its great penetration, low physical sorption, lack of persistent odour and comprehensive killing power make it eminently suitable for the purposes. Moreover, it has no fire hazard and is actually used as a fire extinguisher. On all these grounds it fulfils all requirements, even in climatic conditions which are especially favourable to the survival and development of pests of goods in transit.

*Photos : May and Baker Ltd.*

## *Paris Machinery Show*

The 26th International Agricultural Machinery Show took place in Paris from March 2 to 7, and a report of this will appear in our next issue.

# A Large Scale Paper Making Project in New Zealand

THE development of the Tasman Pulp and Paper Co.'s operations in the Bay of Plenty area, North Island of New Zealand, has been planned on very extensive lines. The production plans and designs for a plant as modern as any in the world have now been completed and construction work is under way on all phases of the project, including the railway, the port development and other associated works.

In so huge a project, involving an expenditure by the Government and the company of about £28 million, the problem of co-ordinating construction is immense, and this responsibility rests on the Commissioner of Works.

### Housing activity

All records will have to be broken in erecting houses and in a few years Kawerau will be a town of 2,500 to 3,000 people. Work on the 35-mile railway to Mururpara is well ahead. Nearly all the earthworks, bridges and culverts are now finished and platelaying has begun. At Mururpara itself, where today there are not more than half a dozen buildings of any sort, a small town to accommodate forest workers, truck drivers and maintenance men will have to be erected. The town plan is now ready and work will start shortly.

Primarily to enable logging crews to be recruited and trained, it is planned to bring the sawmill into operation some months ahead of the pulp and paper mills.

### Electric power

To provide power for the project will involve constructing a transmission line from the Waikato River hydro-electric stations. For this world-wide tenders have been called and orders placed for all the major items of equipment. Much of the equipment is being supplied by United Kingdom manufacturers, but some special items are coming from the United States, Canada, Switzerland, Sweden and Australia. At the wharf site at Port Maunganui development is proceeding rapidly.

### The plan of development

In the first phase of the operations the plant now being erected is designed to produce 75,000 tons of newsprint, about 36,000 tons of pulp surplus to that required in making newsprint and 72 million board ft. of timber. Later, when production is firmly established, more plant may be acquired to increase newsprint output to 150,000 tons and also to produce printing and writing papers.

Development along these lines will make the Tasman company's operations complementary rather than competitive with those of Forest Products Ltd. and Whakatane Board Mills Ltd., two companies already engaged in manufacturing pulp products in New Zealand.

### Plan amended

The designed production differs somewhat from what was originally envisaged. When in 1951 the Minister of Forests made a world-wide offer to sell 23 million cu. ft. of logs annually, rising to a maximum of 27 million cu. ft., a condition of sale was that the successful tenderer would erect an integrated plant to produce 70 million board feet of timber, 50,000 tons of newsprint, 10,000 tons of printing and writing papers and 25,000 tons of surplus pulp for sale. The offer made by a group consisting of Fletcher Holdings of New Zealand and two large American companies was accepted. This group became the sponsors of the Tasman Pulp and Paper Co.

As the project evolved various changes in the pattern of production were considered in the light of the best technical advice. Particular attention was paid to market prospects with due allowance for the production of other units in the industry, and costings and likely returns were carefully analysed. The production of timber, pulp and paper finally selected was judged most likely to give the best returns and the greatest financial stability over both short and long terms.

The best results are expected to come from cutting only high-grade timber from the logs and using the balance for pulp and newsprint. In using the wood supply which the company will contract to buy provision exists to vary the output according to market conditions.

### Timber consumption in New Zealand

New Zealand's annual average consumption of timber—now about 525 million board feet—is rising, but the production of indigenous timber—now about 300 million board feet—is expected to fall. The Dominion will therefore need increasing quantities of timber from exotic forests. Australia's demand for softwoods—now about 300 million board feet annually—is also increasing.

The Tasman Co. is confident of being able to supply part of this demand by producing high-grade and wide utility timber, particularly from Corsican pine and Douglas fir, of which there are 43,000 acres of trees between 22 and 31 years old in New Zealand. Moreover, this country's annual consumption of newsprint is about 35,000 tons, with a possible increase to 40,000 tons. Tasman could supply 20,000 tons, increasing to about 30,000 tons, to the local market.

The annual Australian consumption of newsprint is about 150,000 tons and market surveys indicate a possible increase to more than 200,000 tons if supplies were more readily available at reasonable prices. Tasman therefore expects to obtain a market for at least 40,000 tons as soon as production begins. Concerning surplus pulp, in-

**The site of the pulp mill is in the scrub in the centre**

vestigations show that Australian needs alone will rise to about 45,000 tons. There is a particular demand for the long-fibred type of pulp that will be produced in New Zealand.

### Capital investment

These facts serve to show that the enterprise on which the company has embarked is soundly based. The capital involved is estimated to be £14,800,000. Of this, £8,300,000 will go into the newsprint mill, £3,800,000 into the pulp mill, and £1,400,000 into the sawmill and allied treating and drying plants. Working capital and contingencies are expected to absorb £1,300,000. About £4,900,000 will be spent in 1953-54, probably £8,900,000 in 1954-55, and the balance the following year. In addition to paying for construction work on the site, heavy payments will have to be made for plant being manufactured overseas.

Of the share capital in the Tasman Co., £1 million has been subscribed by the Government and £70,000 by Fletcher Holdings Ltd. It is considered desirable to defer offering shares and debentures to the public until construction is more advanced.

Meantime the Government has agreed to make advances to the company. As stated by the New Zealand Prime Minister in his Budget statement, the year's requirements of the company, as well as for the related works being carried out by the Ministry of Works, will be met from the proceeds of a £10 million loan to be raised in London before the end of the financial year.

The company is registered with a capital of £6 million. Later the public will have an opportunity of investing in the enterprise. Profits will naturally be governed by costs and prices, but conservative calculations indicate that there are reasonably good prospects for a satisfactory profit. As soon as the plant gets into full production, even if prices of products recede somewhat from the present levels, the gross proceeds from sale of products should be of the order of £7·5 million a year.

**Steam rising from Te Teko bore, which will be used to power the mill**

*Photos: Weekly News*

## *Problems of Land Ownership and Land Economics*

The English Ministry of Agriculture and Fisheries announces that projects financed by counterpart funds from United States economic aid for research into land ownership and study in land economics will be carried out by the Department of Estate Management at Cambridge University and the Agricultural Economics Department of Wye College (University of London) respectively. The sum allocated for each project is £8,000 and work should be completed in 1956.

Details of the two projects are as follows:

*Land ownership*. The proposed study at Cambridge will be an examination of the influence of certain elements of landownership upon that level of capital invested in agricultural land at which holdings are neither over- nor under-capitalised and which, for easy reference, can be termed the capital equipment balance. The factors to be considered will include the size of estates and of agricultural holdings upon them; land tenure and national land policy; past capital investments; the financial resources available for providing capital for improvements, credit facilities, Government financial aid, taxation and estate income.

The head of the Estate Management Department at Cambridge University is Mr. Noel Dean, M.A., F.R.I.C.S., F.L.A.S., L.R.I.B.A., and research work is under the direction of Mr. D. R. Denman, M.A., M.Sc., Ph.D., F.R.I.C.S.

*Land economics*. The research work at Wye will consist of a study of the economic aspects of competition between agricultural and non-agricultural uses of land in England and Wales and of the restoration and improvement of land. In particular it is proposed to gather information in a comparative form on costs and returns and, with a view to improving the allocation of land and all scarce resources to land, to work out methods, capable of application in major individual cases, of making economic judgment between competing uses and in favour of or against restoration or improvement.

The Principal of Wye College is Mr. Dunstan Skilbeck, M.A., and the head of the Agricultural Economics Department is Dr. G. P. Wibberley, B.Sc., M.S. (Illinois), Hon. A.T.P.I., who took up duty on January 3, 1954 upon resigning his appointment as Research Officer with the Ministry of Agriculture and Fisheries.

### WORLD CROPS

OUR NEXT ISSUE will be mainly devoted to **Tea,** and we hope to have articles on **Tea Growing** and **Tea Research** in various parts of the world, including South and North India, Ceylon and East Africa. There will also be other articles in this issue, besides the regular features.

## *Death of Mr. W. R. Orrell*

It is with regret that we record the recent death of William Ramsden Orrell. A native of Bolton, he was born in December 1902 and took his B.Sc. in chemistry at Manchester University.

Mr. Orrell joined the Yalding works of Cooper, McDougall and Robertson Ltd. in 1927 as Assistant Chemist and in a short time became Chief Chemist, a post which he held until the merger with I.C.I. on October 1, 1937 which produced Plant Protection Ltd. For four years in the second world war Mr. Orrell was with the Technical Department of Plant Protection Ltd. at the I.C.I. Agricultural Research Station at Jealott's Hill. Later he returned to Yalding as head of the Chemical Section of the company's Technical Department, a post he occupied until 1953.

# Centenary of a German Beet Growing and Research Centre

A HUNDRED years ago, coinciding with the incipient rise of the German sugar-beet industry, a group of energetic and prescient German beet growers, guided by one Matthias Rabbethge, founded a beet seed testing station at Kleinwanzleben, near Magdeburg, which subsequently became an important research and breeding centre for beet cultivation in Germany and abroad. Just before the original locality became part of the Russian-occupied zone in 1945, the Institute was moved to Einbeck in the Western Zone, where a new modern research and breeding station has been built up.

A recent publication of the 'Kleinwanzleben Saatzucht' briefly surveys the development of research methods during the past hundred years, and gives an account of some of the recent activities of the institute.

When selective seed breeding was first taken up in the middle of the last century selection was still mainly based on a rather primitive determination of the sugar contents by means of determining the volume weight in saline solutions with different degrees of concentration. In the absence of present-day knowledge of genetics, seed selection was largely carried out on an empirical basis. These primitive methods were gradually superseded as modern genetic science led to the adoption of individual selection methods and the systematic utilisation of the heterosis effect.

At that stage, further progress was threatened by plant diseases. The answer to this threat was eventually found in a switchover to 'resistance breeding' and to mutation breeding ('polyploid breeding'), *i.e.* the artificial development of new plant strains with higher resistance to disease. It is on these tasks that the Kleinwanzleben Institute has concentrated its efforts during the last 15 years. The results so far achieved hold the promise of a considerable increase in crop yields and, thus, an increase in sugar production.

### The latest progress in polyploid breeding

Under a separate heading, the Kleinwanzleben brochure deals with the results of polyploid breeding experiments in 1951-52.

All the sugar-beet varieties hitherto cultivated have 18 chromosomes, thus determining the hereditary characteristics of the plant. Through certain measures such as 'temperature shocks,' centrifuging or chemical treatment, the number of chromosomes can be doubled so that 'tetraploid' plants are created, with apparent and physiological characteristics distinctly different from those of the normal 'diploid' plants. For instance, the stems of the polyploid varieties are shorter and thicker, and the surfaces of the leaves much larger.

The results of these methods refute the traditional thesis that a high sugar content cannot be reconciled with a high crop yield. It can now be stated with certainty that it is possible to combine the yield of a good standard variety of beet with the polarisation of a good sugar beet so that the sugar yield per beet and per acre can be increased. This has been established beyond doubt in systematic experiments with polyploid beet in selected test fields in France, Belgium, Holland, Germany and Denmark, where the sugar yield per acre has been increased by 10% and more.

### Resistance breeding to combat Cercospora disease

Another sphere in which the Kleinwanzleben Institute has specialised, is the breeding of beet varieties with a high resistance to the dangerous Cercospora fungus which has played havoc with the beet crops in certain areas. The disease can first be recognised by numerous small brown spots which appear on the leaves and finally spread over the whole leaf surface. The leaf is thereby destroyed, and new leaves, formed by the plant at the expense of the sugar contents, are subsequently destroyed in the same manner. The disease has the effect of reducing the quality of the beet as well as the quantity of the crop, which may be decreased by as much as 40%. In addition, there is an undesirable increase in the contents of nitrogen in the root.

Successful attempts have been made to fight the disease by preventive spraying with copper fungicides. But this method is expensive both in money and labour at a time when all hands are needed for harvesting; moreover, repeated spraying is bound to cause mechanical damage to the leaves. It is therefore preferable to fight the disease by breeding fungus-resisting sugar-beet varieties. In the early thirties, the institute succeeded in breeding a beet variety ('22') which made it possible to check a widespread outbreak of the disease in Spain.

Following upon this first great success of resistance breeding methods, the new variety was systematically cross-bred with high-quality Central European beet until a new variety was created, known as 'CR,' characterised by good sugar content, low content of nitrogen, excellent leaf crop and high fungus resistance. But even the 'CR' variety is regarded as but another step toward the end of producing sugar beet variety with a yield that will not be affected by the disease, even without chemical treatment.

### The fight against virus yellows

The Institute has also been successful in the fight against another sugar beet disease known as 'virus yellows' which is spread by certain species of aphis. The disease, which affects the leaves, leads to destruction of chlorophyll and the plant is robbed of its sugar by forming new leaves which are, in their turn, affected by the disease. Virus yellows may lead to a 50% reduction in yield, accompanied by a reduction in the sugar content, so that the sugar yield may, in extreme cases, be reduced by 65%.

Six years ago, the Kleinwanzleben Institute began the systematic selection of beet strains with high resistance to this infection. Methodical cross-breeding has already produced a variety where the reduction of the sugar yield under the impact of the virus infection has been limited to 17%. It is confidently expected that the systematic continuation of this breeding programme will finally produce beet varieties which will be virtually unaffected by the disease.

E. ROCKWELL

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## *Technical News*

The following articles appear in the April issue of **Food Manufacture:** 'Description of a Dublin Quick Freezing Factory'; 'The Vitamins, Part 2'; and 'Hygiene in Meat Manufacture.'

In the April issue of **Fibres (Natural and Synthetic)** Julius Grant writes on 'Instruments Used in the Paper Mill Laboratory,' and A. J. Hall on 'Measuring the Wear Resistance of Textile Fabrics.'

The main articles of the April issue of **Petroleum** are 'Simple Corrosion Theory as an Aid to Materials Selection—1,' by Dr. T. K. Ross; 'The Choice of Lubricants,' by Dr. W. Davey; and 'Operational Research,' by D. C. Lennon.

(*Left*) **Acre Gap, Lincolnshire, immediately after the storm, showing wrecked steel groynes and** (*left*) **flooded land.**
(*Right*) **Acre Gap after the new defences were finished**

# The East Coast Floods in England in 1953

ABOUT 1 million acres of land in Eastern England are below the level of the highest spring tides. They are protected from flooding by some 1,100 miles of sea and tidal river defences maintained by river boards. These embankments were, in general, designed to withstand the highest tides on record. During the night of January 31, 1953 a surge of nearly 10 ft. in the North Sea during a spring tide raised the sea at many places 2 ft. higher than any level previously recorded. This phenomenal tide was backed by fierce gales and all down the East Coast the defences were damaged or overtopped.

By the early hours of February 1 some 160,000 acres were covered by sea water and there were some 1,200 breaches in the defences. The toll of the disaster was:

Over 300 lives lost.

24,000 dwelling-houses flooded or damaged.

200 major industrial plants inundated.

Agriculture suffered heavily in the floods; 160,000 acres of agricultural land were inundated. The majority were highly productive, stretching from Northumberland to Kent. A further 3,000 acres were damaged through flood water backing up drains. Over 1,000 cattle, 9,000 sheep, 2,500 pigs and 33,500 head of poultry were killed. In addition, extensive damage was done to farmhouses and buildings, stacks, machinery and fences.

As soon as the disaster became known, emergency plans were brought into action and immediately troops with equipment began to converge on the coast for rescue work and to help with repairs.

***It is now over a year since the occurrence of the disastrous floods in the Eastern Coastal districts of England caused damage and havoc unparalleled in recent times. The Ministry of Agriculture recently held a press conference at which an account was given of the progress made during the past twelve months in restoring the damage sustained in the areas affected.***

## Repair of defences

The first job was to fill the breaches. Major problems of access were overcome, floating craft being used in some cases and new roads constructed in others. In the emergency period 15 million sandbags, tens of thousands of tons of stone and several thousand tons of steel sheet piling were used. As the breaches were closed and the water receded plant was moved in to strengthen the banks with clay and at vulnerable points by driving steel sheet piling. In a few days the situation was brought under control and in a few weeks every breach in the defences was sealed. While emergency work was proceeding plans were prepared for the rapid reinstatement of the defences in time to withstand the autumn gales. Many problems faced river boards along the thousand miles of tidal defences.

The work of reconstruction has gone forward continuously and by the end of September the Minister was able to announce that the defences were generally as strong as, and in many cases stronger than, before the floods. Reconstruction so far has involved moving well over 10 million cu. yd. of earth, using 5 million stone blocks for facing sea walls and using over 1,000 mechanical excavators and bulldozers.

Work done on sea defences to date has cost some £20 million. The Government is bearing the whole cost of restoration and most of the cost of improvement works. The Exchequer's share is likely to amount to £22½ million out of a total expenditure of £24 million to which river boards are at present committed.

## Restoration of the land

Following rescue operations attention was switched to the problem of rehabilitation of the flooded land. The majority of crops will not grow if there is much salt in the soil. Beet will stand 2 tons, barley perhaps 2½ and the common grasses 3 to 5 tons per acre. Subsequent soil analysis showed concentrations of 50 to 60 tons of salt per acre in some areas after the flood waters had receded. How to remove this salt was the first problem.

## Soil structure

Another and more serious long-term problem was damage to soil structure. The action of salt (sodium chloride) on clay in the soil produces a sodium clay. This turns the soil into a sticky and pasty mass when wet and into large bone-hard clods which

fail to crumble when dry. To attempt to cultivate such land would cause similar conditions at greater depth. Restoration would be prolonged and might take anything up to 15 years. Rain water is one of the most effective ways of getting salt out of the soil. The first step was to ensure that the salt-laden surface water got away as quickly as possible. Main drains and ditches blocked by flood-borne debris had to be cleared. River boards were given this responsibility and the cost was borne by the Government.

Apart from measures to aid drainage, one of the most helpful steps is the application of gypsum (calcium sulphate). This displaces the sodium absorbed in the clay and helps to re-establish a calcium clay. Last year gypsum was applied at the rate of 2 to 2½ tons per acre to over 50,000 acres and to some 700 acres of allotments and gardens as well. 115,000 tons of gypsum were supplied and delivered, free of charge to farmers, at a cost to the Government of £380,000. About the same tonnage of free gypsum is expected to be supplied again this year.

### Salt content of the soil

N.A.A.S. staff are still keeping a constant watch on the salt content of soil and advising farmers on rehabilitation measures. This work will go on for several more years. Over 20,000 soil samples were taken last year and a similar number are expected to be required this year.

Once the salt content has fallen sufficiently a rehabilitation crop—barley or grass—is sown. Much of the arable land flooded is expected to be cropped in this way next summer, not so much for yield, but for the effect on soil structure. Only 10% is expected to give a normal yield, the remainder probably giving about a half. It may be another three or four years before some areas are restored to normal production.

### Acreage payment scheme

Even when a crop can be grown farmers' income is likely to be considerably reduced. To help farmers through this difficult period legislation was passed which gives the Minister power to make acreage payments schemes for the rehabilitation of salt-damaged land. The payments vary from £80 per acre for certain expensive horticultural crops to £4 per acre for partially damaged grass. Under this scheme about £1,350,000 was paid out in 1953. A second scheme has been made for 1954 and the cost is expected to be about the same.

SUMMARY OF FINANCIAL HELP (to date)

| | £ |
|---|---|
| Farm drainage (75% of £300,000) | 225,000 |
| Free gypsum | 380,000 |
| Acreage payments | 1,350,000 |
| Miscellaneous (immediate relief measures for livestock, repairs to fences, hedges, roads, removal of debris, etc.) | 72,000 |
| Total | £2,027,000 |

**Impounded flood water discharging through breach at Sea Palling, Norfolk**

## *Future Meetings*

The following is a list of meetings and conferences of international importance to be held in different parts of the world during the ensuing months of 1954.

### FAO meetings

Forest Grazing Panel, Rome, March 29 to April 3, or April 5 to 10.

Third Meeting of the Working Party on Mediterranean Pasture and Fodder Development, Ankara, May 17 to 23.

Third Meeting on Wheat and Barley Breeding in the Near East, Damascus, May.

European Committee on Agriculture, Sixth Session, Rome, June 14 to 19 (tent.).

Working Group on Torrent and Avalanche Control, Switzerland, June.

Pasture and Fodder Conference for Arab Countries, Baghdad, August or September.

Working Party on Rice Breeding, Fifth Meeting, Tokyo, October 4 to 10.

Working Party on Fertilisers, Fourth Meeting (IRC), Tokyo, October 4 to 10.

Preparatory Meeting on the Economic Aspects of Rice Breeding, Tokyo, October 4 to 10.

International Rice Commission, Fourth Session, Tokyo, October 12 to 19.

Training Centre on Pasture, Range and Fodder Development in the Near East, Ankara, May 23 to July 23.

### Other meetings

Second Pan - American Congress on Agronomy, Piracicaba, Brazil, April 5 to 11.

Third International Congress on Citrus Culture, Algiers, May 15 to 19.

ECAFE: Regional Technical Conference on Water Resources Development, Tokyo, May 17 to 22.

International Commission of Agricultural Industries, 10th Congress, Madrid, May 30 to June 6.

Third Rubber Technology Conference, London, June 22 to 25.

International Wool Textile Organisation, 23rd Conference, Brussels, June.

European Grassland Congress, Paris, end of June to beginning of July.

Fifth International Congress of Soil Science, Leopoldville, Belgian Congo, first half of August.

Conference on Plant Protection in Hot Climates, Marseilles, September 22 to 24.

Joint OIE/FAO Meeting on Parasites, Rome, September.

### *Irrigation in Algeria*

We regret that in the article ' Irrigation in Algeria ' by Mr. D. Anley which appeared in our last issue, the captions to the illustrations on page 107 (*bottom*) and page 108 (*top right*) were transposed.

# Trials with Pelleted Seed in New South Wales

THE idea of pelleted seed originated in the United States in 1943. It was claimed that pelleting of vegetable seed, which involves coating the seed with alternate layers of a sticker and a coating material, produces a spherical ball containing a single seed and so allows precision planting and reduces thinning costs. Reference was also made in overseas reports to the possibility of incorporating into the pellet-coating ingredients for the control of seed- and soil-borne diseases and soil insects, and also fertilisers which would promote healthy seedlings and increase plant growth.

In Australia little attention had been given to this innovation prior to 1946, but in that year the N.S.W. Department of Agriculture set up trials with pelleted seed of both vegetable and pasture plants to test their possible value under New South Wales conditions.

An obvious disadvantage of pelleted seed would be its greater cost. However, it was felt that trials were warranted to determine if pelleted seed had certain advantages. For example, would pelleted seed have a longer storage life? Would less seed be required, due to seed placement? Would disease be controlled? If fertilisers were added to the coating given each seed, would this be an easy and effective way of applying fertiliser in close proximity to the seed? Could pelleted pasture seed be used for aerial sowings in country inaccessible to machinery?

## Poor germination

Trials were conducted at departmental experiment farms and colleges with pelleted vegetable and pasture seeds. However, results were mostly disappointing. Extremely poor germination of both pelleted vegetable and pasture species occurred in many cases. Germination tests in the Department's seed testing laboratory in Sydney revealed large differences in germination percentages as between treated and untreated seed (see Table 1) and only in rare cases did the germination percentage of pelleted seed reach the standard required by the N.S.W. Agricultural Seeds Act.

TABLE 1

RESULTS OF LABORATORY GERMINATION TESTS OF PELLETED AND UNTREATED SEED

| | *Germination* (%) | |
|---|---|---|
| | *Pelleted seed* | *Untreated seed* |
| *Phalaris tuberosa* .. | 18 in 15 days | 52 in 15 days |
| Wimmera rye | 45 ,, 12 ,, | 88 ,, 12 ,, |
| Perennial rye | 58 ,, 12 ,, | 74 ,, 12 ,, |
| White clover | 68 ,, 12 ,, | 93 ,, 12 ,, |
| Lucerne .. | 84 ,, 12 ,, | 98 ,, 12 ,, |

## Vegetable seeds—soil tests

Soil tests on the germination of pelleted vegetable seeds yielded results of the following order:

TABLE 2

| Batch | *Germination* (%) |
|---|---|
| 12 Cauliflower, 5 months.. | 60 |
| 13 Cauliflower, Maincrop.. | 60 |
| 14 Cabbage, Early Jersey.. | 68 |
| 15 Parsnip .. .. .. | nil |
| 16 Lettuce, Great Lakes.. | 40 |
| 17 Carrot, Main Table .. | nil |
| 18 Broccoli.. .. .. | 72 |
| 19 Carrot, Chantenay .. | 16 |

Under the N.S.W. Agricultural Seeds Act the minimum germination percentage allowed for *Brassica* spp. is 65%. Therefore the broccoli (72%) and Early Jersey cabbage (68%) would conform. The cauliflowers were slightly below standard. The standard for lettuce is 50%, for parsnip 40%, and for carrot 50%, so batches 15, 16, 17 and 19 are well below the requirements.

The pellet coating clung to the seeds when moistened, preventing cotyledon emergence and resulting in elongated hypocotyls. Despite alterations in the composition of the pellet and in the germination technique, poor germination remained a major limiting factor.

## Pasture seed

In a trial at Wagga Agricultural College uniformity of the stands produced from pelleted seed of *Phalaris tuberosa* was not outstanding when compared with that produced from untreated seed, nor was any apparent difference noted in height and vigour of treated and untreated plants. Similar results were obtained at other experiment farms in trials with species such as lucerne, Wimmera rye and subterranean clover. The latter was tested at Wagga for two years and emergence of seedlings was so slow, due to slow disintegration of pellet coating, that by the time seedlings were above ground the weather was too cold for them to develop satisfactorily.

## Small-seeded vegetables

Trials at Hawkesbury Agricultural College showed that the use of pelleted seed gave a more even spacing of small-seeded vegetables, such as lettuce and carrots. There were, however, delays in germination, which, in the case of crucifers, caused an undue delay in development from which these species never fully recovered. Pelleted lettuce seed gave a poor germination—less than 20%—and therefore the crops were very patchy.

## Trials discontinued

In the trials undertaken pelleted seed did not show to any advantage over untreated seed and in many cases the pelleting treatment adversely affected the germination and establishment of both vegetable and pasture species. Consequently, the trials have been discontinued.

## Other disappointing results

In America, where private enterprise and extensive tests by state stations gave an impetus to the use of pelleted seed, reports have been conflicting and generally not encouraging. In an extract from an article entitled ' The Quality of Seeds on Sale in New York in 1950'[1] it was noted that: ' The field results with the few pelleted seed lots which were in the 1950 trials did not substantiate the claims made on the packets and listed as advantages for pelleted seeds, namely, " promotes early growth," or " promotes greater emergence, healthier plants, faster maturity, better flowers." Seed which was not pelleted, planted in adjoining rows, performed fully as well.'

Again, it has been pointed out that in samples ' in which a high degree of mechanical purity is hard to obtain there will undoubtedly be considerable pelleting of inert matter, weed seeds and other crop seeds, along with some multiple seeds.' In addition, while ' some physical injury to the seed in the processing or from some toxicity in the pelleting material ' was indicated in test samples of cabbage and onion, ' the process invariably throws lettuce seed into secondary dormancy.'[2]


REFERENCES

1. Bulletin 746, N.Y. State Ag. Exp. Stn., Geneva.
2. Proceedings Official Seed Analysts of North America, 1950.


(*From The Agricultural Gazette of New South Wales.*)

## Taylor Woodrow Visit

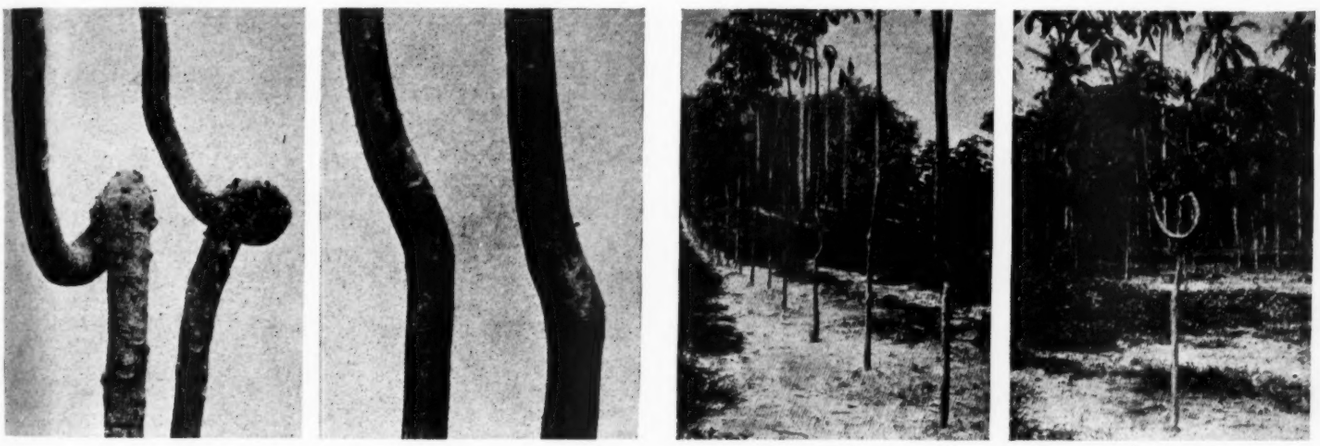
Mr. E. J. Woolf, a director of Taylor Woodrow Ltd., the building and civil engineering contractors, recently made a tour of centres in East Africa and the Federation of Rhodesia and Nyasaland. His visit was to develop further the plant manufacturing sides of the groups activities, which are of growing importance in the building, civil engineering and agricultural fields.

# A Remarkable Malady in Young Budded Rubber in Malaya

The Rubber Research Institute of Malaya has recently reported in its *Planters' Bulletin* a remarkable malady on budded rubber, in which well-grown budded plants were found to have made a complete turn in the stem at about 4 ft. above ground level: above the turn the stem grew straight up to the normal-looking canopy about 10 ft. high. The plants were healthy throughout both in the normal and the distorted portions. Other specimens were found to show a less developed stage of the malformation. A characteristic feature of the malformation is a concentration of leaf bases in the distorted region.

The trouble was reported from an estate in Central Perak and on examination in the field it was found that many hundreds of plants had been affected in an area of over 100 acres. The severity of the affection is reported to have varied from a barely discernible bend to cases which had completely twisted round or had bent sharply two or three times. Closer examination showed that bark fissures in the region of the bend ran spirally round the stem, showing that the stem had been twisting at the same time as it had been turning.

It is known that distortion of the stems of young plants may at times arise from contamination with hormone weedkillers or from mealybug attack, but no hormone weedkillers had been used in the area where the cases reported occurred, although it is not possible to say whether the plants had been attacked by mealybugs when they were very young. As the authorities of the Rubber Research Institute remark, the problem is baffling and can only be approached by further observation of affected plants or by examining other cases which may appear elsewhere.



(*Left*) **The first pair of specimens to be received showing a complete turn.** (*Left centre*) **A second pair of specimens sent in to show a more mild form of the trouble.** (*Right centre*) **A row of buddings in the field, all of which show the bending to a greater or lesser degree.** (*Right*) **The most severely affected plant encountered in the field. It exhibits the extreme form of a complete loop**

# Avalanche Control Conference

The first international conference ever to discuss avalanche control will be held in Switzerland this summer under the sponsorship of the Food and Agriculture Organisation of the United Nations. FAO comes into the field of avalanche control through its concern with erosion and forestry. Usually trees can do little to control an avalanche after the snow has begun to slide. The snow will first rush between the trees and then, as it gathers speed and weight, it will take the trees with it. But extensive tree plantings where the avalanches start can anchor the snow and prevent the avalanche from ever happening. Above the treeline the control measures must be engineering works.

The conference will be held by members of the working party on torrent and avalanche control set up by FAO's European Forestry Commission in 1951. The working party studied engineering projects and reafforestation measures in the French Alps in the summer of 1952 and this year, in Switzerland, will exchange information on an international basis on the problems of snow and avalanches. At the end of the conference FAO will issue a report summarising European experience in avalanche control.

Shortly before the war research stations were set up in a number of European countries, including Switzerland, Austria and France, to study the behaviour of snow under varying climatic conditions and on varying terrains. The research carried out at these stations has proved that the chance of the 'white death' is not necessarily an inevitable part of snow sports. A very high proportion of avalanches can be prevented and where prevention is occasionally not possible the time they will occur can usually be foretold with considerable precision.

## Use of Aircraft Against Locusts

(*continued from page* 154)

composite sample of the whole roosting site, gave a mean and standard error of $38 \pm 5.8$ dead per square yard, corresponding to a total kill of $37 \pm 6$ million locusts. The net cost of this operation was £195, and, while between 60 and 80 tons of locusts had thus been killed by 50 gal. of insecticide containing 55 lb. of active ingredient, the actual efficiency of the operation (comparing the kill obtained with that theoretically possible by applying the same quantity of insecticide at the median lethal dosage) was only 2%.

*Photos: Auster Aircraft Ltd.*

# Dwarf Palm in Morocco and Algeria

THE dwarf fan palm *Chaemorops humilis* is a native of North Africa and also occurs wild in some parts of Southern Europe. It is especially abundant in Tunis, Algeria and Morocco. From the leaves fibre is extracted which is an important export from various parts of this region under such names as Crin vegetal, or Vegetable Horsehair or Vegetable curled hair. The fibre is extracted from the leaves by the action of a rapidly revolving spiked drum, the leaves being kept moist during this operation by having a jet of water sprayed on them. Afterwards the fibres are dried and twisted together in the form of a rope, which is untwisted after a week or so when the fibre presents a crinkled appearance and is then known to the trade as Crin vegetal. It is exported in either its natural green state or it may be dyed black with logwood and sulphate of iron. The chief use of the material is in upholstery as a substitute for horsehair; it is sometimes preferred to coconut coir from Ceylon on account of its greater resiliency.

When it is allowed to spread uncontrolled the palm may become a dangerous weed very difficult to eradicate. In its wild state the plant only grows to a height of 2 ft. or so, but the roots may penetrate to a depth of 3 ft. or more. The plant establishes itself in suitable situations very rapidly and the only known method of eradicating it is by deep ploughing, which is often almost an impossible task in heavy clay soils.

Recently the problem of dwarf palm infestation and eradication was investigated by a representative of the Massey-Harris-Ferguson combination who spent six weeks in Spanish Morocco and Tangiers giving demonstrations of Ferguson equipment to Government officials and farmers. In the course of these demonstrations, which took place at Tangiers, Tetuan and Larache, he was constantly asked whether his equipment was capable of ploughing out dwarf palms. After several trials, he found the following method to be almost entirely successful: The foliage of the palm was first cut to ground level using a tractor-mounted mower and working at a high cutter-bar speed. The ground was then ploughed with an ordinary two-furrow 12 in. mould board plough and cross ploughed with a disc plough working at the greatest possible depth. Although the discs severed the roots, leaving them exposed on the surface, they could not always be worked deep enough to account for the whole plant. It is thought, however, that a Disc Terracer, having a deeper cut, will be completely successful.

**Cutting dwarf-palm with a mower**

**Ploughing out dwarf-palm with a disc plough, the foliage having already been cut with a mower and the ground ploughed once with a mouldboard plough**

## British Standard for Crates for Cabbage Lettuces

The British Standards Institution has just published the second in a series of standards for containers for horticultural produce. This is B.S. 2078 : 1954, 'Rigid wooden crates (returnable) for cabbage lettuces.' Enquiries have shown that over 90% of the rigid crates used for lettuces in the United Kingdom are of approximately the same dimensions. These have, however, differed very slightly and the British Standard lays down precise measurements.

In some areas there is a long tradition of using special sizes and it is generally recognised that these will continue to be used. On the other hand, the evidence before the Institution's committee on horticultural containers does not suggest that there is justification for including these special crates in the standard at the present time. The position will be kept constantly under review. The crate specified in the present standard is designed for carrying cabbage lettuces, but it will very probably be found suitable for other produce, such as spinach, radishes, beetroots or carrots.

# South African Crop Prospects

OUR South African correspondent has sent us the following information on agricultural developments in the Union of South Africa.

### Fruit preservative method

Fresh grapes, pears and apples may soon be available all the year round as a result of research at the Cape Western Province Fruit Research Station in Stellenbosch. Recently it has been found that some varieties of pear keep as well in cold storage as most kinds of apples, and certain types of grapes can be kept fresh for six months if they are preserved in cold storage in an atmosphere containing a trace of sulphur dioxide gas. An official of the research station said the gas was used only in minute quantities to preserve the grapes. The gas prevented fungal infection of the fruit—the biggest snag in storing grapes. Sulphur dioxide would damage the skins of pears and apples, which are preserved by controlled amounts of carbon dioxide. Apart from the obvious benefit to the market, the longer preservation of fruit would prove a boon to the country's canning industry. Fruit ripens rapidly and canners, until now, have had only a limited time at the peak of the season to process all the fruit for canning. The new development would probably mean that a much greater amount of fruit could be canned with much less wastage. A number of Cape Western Province grape farmers have already built their own sulphur dioxide plants to preserve fruit and officials of the research station have assisted them with technical advice. It has been suggested that the same processes should be used for vegetables.

### Deciduous fruit

Accurate estimates of the 1953-54 grape and deciduous fruit crops cannot be formed at this stage of the season but the outlook in nearly all important fruit-growing districts of South-Western Cape Province continues for the most part to be promising. Generally, the weather has been favourable, although some damage has been caused by recent late frosts in some areas, and farming reports indicate that orchards and vineyards have not so far been affected to any important extent by plant diseases and grub pests.

### Weed danger

If South African farmers continue to turn a blind eye to the weed menace on their farms the time will come when food production will be badly affected. That is the warning given by the Soil Conservation Board in its sixth annual report. The Board says that results of efforts to bring home to farmers the absolute necessity for timely weed eradication have been disappointing. The Board also complains that farmers are still indifferent to warnings of the deterioration of the soil caused by autumn grass burning. The good work already done in soil conservation is stressed, but the gap between erosion and conservation has not been reduced to any significant extent yet.

### Cotton experiment

An experiment in cotton production which may lead to the opening of a new source of income for farmers in the Great Fish Valley has been started on four farms at Mortimer, near Cradock. Each of the four farmers planted six morgen of fertile soil with cotton and a few weeks later the plants were 2 in. high and seemed promising. If conditions remain favourable these farmers expect to pick their first crops in April or Mav. Farmers throughout the valley are watching the experiment with interest. Arrangements have been made to market the cotton.

The co-operative cotton mills at Upington have undertaken to buy the full crop. Conditions are ideal in the Great Fish River Valley. The soil is even better than that along the Orange River. With the enormous irrigation facilities of Lake Arthur, farmers have every opportunity for planting on a large scale. Trends on the cotton market are promising and good prices are expected in the coming season. In the Upington district farmers obtained as much as £300 per morgen for cotton.

### Guava developments

Developments are taking place in the guava industry which will make it one of the Union's important fruits. New varieties have been developed at the Cape Western Province Fruit Research Station, and the manufacture of guava juice was started this year. One of these developments is a proposal made recently by the Guava Growers' Association to the Department of Nutrition that guava juice should be supplied to schoolchildren as it renders them less susceptible to colds. The Association has pointed out that guavas are richer in vitamin C than any other fruit, containing 20 times as much of this vitamin as citrus fruits, and it will be possible to supply this rich juice all the year round to schools. The production of juice started in one factory and is now being undertaken by another. This production is being watched with keen interest by growers. Since 1945, big plantings of guava trees have been carried out in the Western Province, and most of these trees will start bearing in 1955.

This will bring about a big increase in output of fresh fruit, canned fruit and juice. The new varieties developed by the Western Province Fruit Research Station scientists at Stellenbosch produce guavas far superior to the best on the markets today.

These have not been released generally yet to farmers, but this is expected to take place soon. The new varieties are expected greatly to increase the popularity of this fruit, especially as the quantity of pips in the new guavas have been further reduced in deference to public taste. The Association has denied that guava pips cause appendicitis, as was popularly believed at one time, but the reduction of the pip-containing flesh helps to improve the eating qualities of the fruit.

### Avocado pears

A taste for avocado pears is being fostered in Britain by a few leading Transvaal Lowveld growers. They believe that the export of avocados might become a Transvaal industry second only to the export of citrus fruit. Trial shipments on a small scale began about four years ago, and during the height of the past season up to 500 trays a weeks were reaching England.

### Seed maize exports

The Maize Industry Control Board has decided to release about 50,000 to 60,000 bags of maize to be exported to overseas countries for seed, and exporters will be required to pay a levy of £1 per bag of 200 lb. The exporters will have to bear the costs of export. In the past the Board has allowed the export of limited quantities of seed maize to African territories south of the Sahara against export permits issued by the Department of Agriculture, while the export of seed maize to overseas countries was prohibited. The issue of these export permits to African territories was subject to payment of an export levy of £2 a bag. As a result of representations made to the Board it has now been decided to allow the export of a limited quantity of seed maize to overseas countries subject to an export levy of £1 per bag of 200 lb.

There is a big demand for seed maize in various overseas countries, especially in Germany.

## Quinua

After travelling over a large part of the Andean Altiplano, Alejandro Quesada, one of FAO's technical assistance experts and member of a joint United Nations Mission in Peru, found a native product called quinua, which can be cultivated under very unfavourable conditions and has been one of the staple foods of the people living in that area since the very ancient times of the Incas.

Recent studies have proved that quinua has a high content of very digestible proteins, vitamins, starch and other basic nutrients. It can be cultivated at over 12,000 ft., withstanding severe frost and thrive in alkaline soil, poor in organic matter and with little rain. But quinua has the drawbacks of very low yield, uneven ripening and difficult threshing. Worst of all, it had a strong soapy taste. While the Peruvian agronomists managed to improve cultivation methods, FAO's expert encouraged several commercial firms to find a way of processing quinua so as to offer it in a palatable and attractive form to the public.

Field experiments brought forth new and more productive varieties practically free of disagreeable tastes and which ripen uniformly. The threshing question was also satisfactorily solved by altering the ventilation system of the ordinary threshing machine. Finally, a commercial firm is now manufacturing quinua in flakes—just like corn flakes—being more palatable and nutritionally superior in every respect.

A recent analysis has shown that 100 g. of quinua can produce 355 calories—much more than condensed milk, eggs, fresh fish and every kind of vegetable. Its protein content is 10.7%, which is more than fresh milk, rice, oats, barley, corn, wheat, etc., and it contains large amounts of calcium, sulphur, iron, thiamine and riboflavin.

**Exmoor National Park—the Vale of Porlock**

## In a British National Park

The recently designated National Park of Exmoor includes not only the moor and much country immediately surrounding it, but also most of the Brendon Hills with the whole of the 2,000-acre Brendon Forest. Although this forest includes some patches of older woodland, it is for the most part a creation of the last 30 years. One photograph shows the forester-in-charge with the largest tree of the new plantations, a 25-year-old Sitka spruce. Modest though this may seem, the forest is already turning out a considerable weight of mining timber in the form of small pit props and useful quantities of poles and fencing stakes.

Since the National Park idea is widely misunderstood, it may be noted that designation means rather less than most people imagine. There are no increased rights of access over cultivated or farm lands and very little interference with farming or forestry. Most National Parks include a good deal of wild uncultivated territory (this is true of Exmoor), but there is also much normal and fruitful country. The authorities pay special regard to the preservation of scenery; persons wishing to erect new farm buildings may sometimes receive orders about their siting or design.

**A forester inspecting the largest tree in the young forest**

## Jute Consumption in Britain

The consumption of jute goods in Britain in 1953 was greater than for any year since the war, says a statement issued recently in Dundee by the British Jute Trade Federal Council. A record post-war production has also been achieved by the spinners and manufacturers in Dundee and district.

The increased offtake is accounted for in some measure by the successful campaign by the industry to encourage a return to the use of jute goods by a number of large consumers who were forced into substitute packaging of one kind or another in 1949 and 1950 during a period of temporary shortages of jute following the partition difficulties in India.

Since the end of the war the raw jute consumption in Dundee and district has been almost doubled. The rise has been steady every year with the exception of 1952, when the world textile recession caused unemployment and short-time working in the jute trade. However, jute was the first industry in the textile group to recover stability and started this year with substantial stock replacement orders. Heavy demands were subsequently made for yarn supplies to the carpet industry and an improvement in the linoleum industry resulted in large orders being placed for hessian.

# RESEARCH DEVELOPMENTS

## Toxic Chemicals in Agriculture

THE second report of a working party under the chairmanship of Prof. Zuckerman on precautionary measures against toxic chemicals used in agriculture was published recently.* The report deals with possible risks to consumers from the use of toxic substances on agricultural products and in the storage of food. The working party finds generally that there is no evidence of human illness arising from toxic substances in current use. The Government accepts the view of the working party, however, that the position must be kept under close and continuous review and every reasonable precaution taken to obviate such risks.

### Advisory committee

Accordingly, the main recommendation of the working party for the establishment of an advisory committee has been accepted. The committee will comprise representatives of the departments principally concerned with the various aspects of the problem and of the agricultural and medical research councils and will have somewhat wider terms of reference than the working party envisaged. Its function will be to keep under review all risks that may arise from the use of toxic substances on agricultural products and in the storage of food and to make recommendations to the Ministers concerned. The committee will be assisted by such sub-committees of technical experts as it may find necessary, whose functions will include the ascertaining of facts regarding particular products and arranging with the interests concerned for the necessary experimental work and investigations to be done. The committee will have an independent chairman and Prof. S. Zuckerman, C.B.E., F.R.S., has agreed to accept this appointment for an initial period.

Preliminary discussions with the Association of British Insecticide Manufacturers suggest that it should be possible to arrange in accordance with the working party's recommendation that new toxic substances proposed to be used on agricultural products or new uses proposed for existing substances which may involve toxic hazards should be notified to the advisory committee in such a way as to provide safeguards against premature disclosure. The trade is fully alive to the possible risks associated with the use of these substances and the Government hopes and expects that voluntary arrangements on these lines will be sufficient to ensure that adequate safeguards are taken when new toxic preparations and applications are introduced and that there will be no need to make notification a statutory requirement.

### Bacterial rodenticides

The report reviews the use of bacterial rodenticides in the light of possible risks to public health and recommends that departments and the interests concerned should consider whether, for this reason, their use should be avoided. Consultation has already taken place on this suggestion between the Ministry of Agriculture and the firms concerned and these firms have offered to collaborate with the appropriate departments who will keep the matter under close review, bearing in mind that these preparations, which are not on sale to the general public, have been in use on a considerable scale for many years. In the meantime, certain safeguards in their use are suggested in the report. The recommendations that bacterial rodenticides should be limited to those containing the danysz variety alone of *salmonella enteritidis* and that they should be used only by skilled operators employed by recognised firms are already part of current practice. The recommendations that the use of these rodenticides should not be permitted in food kitchens or other premises in which food is prepared or sold, and that unconsumed baits containing bacterial cultures should be removed, have been accepted by the trade for application with minor modifications to meet the requirements of everyday practice.

The working party suggested that consideration should be given to the registration of all firms or individuals who apply toxic substances to agricultural products by contract or of farmers who undertake to provide a similar service to other farmers. It is thought, however, that it should be possible to make those using these materials aware of the proper techniques and times of application by other means.

Other recommendations in the report, dealing with the giving of advice on the use of toxic substances, the encouragement of research, the improvement of methods of analytical control and the encouraging of international action, have been accepted and appropriate action will be taken.

*'Toxic Chemicals in Agriculture—Residues in Food,' published by H.M.S.O., price 1s. 6d.

## Retirement of Sir Reginald Franklin

Sir Reginald Franklin, K.B.E., C.B., Deputy Secretary, Ministry of Agriculture and Fisheries, will retire at his own request from the public service on April 30.

**Mr. L. B. Neumiller *(left)*, the president of the Caterpillar Tractor Co., and Mr. H. S. Eberhard, executive vice-president, unveil a large medallion at Peoria, Illinois. This medallion represents a commemorative programme the company is conducting this year to celebrate the 50th anniversary of the world's first practical track-type tractor. The Holt Manufacturing Co., one of Caterpillar's parent companies, successfully tested the first practical crawler in 1904**

# NEW BOOKS

## Advances in Agronomy

Vol. v. Edited by A. G. Norman. Pp. viii + 422. Academic Press, 1953. New York.

This series of volumes is now becoming vastly different from the normal run of review journals. The reviewer has pleaded for personal, somewhat discursive monographs on agronomic subjects rather than the merely annotated results of an exhaustive combing through volumes of abstracts. More than one-third of the present number is occupied by one such long monograph, 'A Half Century of Wheat Improvement in the United States,' by S. C. Salomon, O. R. Mathews and R. W. Leukel. The scope of the subject is enormous, the treatment is well balanced and the style is pleasing. Few specialist wheat breeders will turn to this for enlightenment, but most agronomists could read it with profit and pleasure.

R. R. McKibbin, together with five other authors, has compiled a short symposium on 'The Changing Pattern of Agriculture and Horticulture in Canada.' The multitude of subjects which are mentioned and the symposium treatment have made a rather sketchy and disconnected whole. The lack of any emphasis on the salient features makes it hard for the reader to appreciate what has happened.

We have come to expect a high proportion of reviews within the subject of pedology in *Advances in Agronomy*, and this time there are 'The Soil Organic Fraction' by F. E. Broadbent and 'Chemical Weathering of Minerals in Soils' by M. L. Jackson and G. D. Sherman. These are specialised reviews and the latter particularly is unlikely to be read by any but the soil scientists.

'Progress in Agricultural Engineering' by L. W. Hurlbut is a hotch-potch of notes on all and every kind of new agricultural machinery. It might be a transcribed notebook written after an hour's walk round an agricultural show. The copies of illustrations are like most photographs of agricultural implements; they show just enough to rouse the interest, but far too little to satisfy the curiosity. The following paragraph is from this review: 'A mechanical onion harvester is described by Lorenzen (1950). A sugar cane harvester is described by Duncan (1950).' Not all the review is like this, but most of it is.

'Soil Management for Conservation and Productivity' by O. R. Neal is a short and direct review of some of the literature concerning influence of cropping practices and rotations on soil fertility and the control of erosion.

In an annual review volume it is too much to expect that all the articles will be good or even moderate and the old faults are still present in some reviews, but the editor's wisdom in again occupying half the volume with excellent material has made it nearly indispensable to the agronomist with wide interests, and so to all real agronomists.

J. L. HARPER.

## Plantation Crops

A summary of figures of production, trade and consumption relating to sugar, tea, coffee, cocoa, spices, tobacco and rubber. Pp. iv + 144. Compiled by the Commonwealth Economic Committee, 1954. H.M.S.O. 5s.

This is the fourth post-war issue of the review of the production and trade in a number of mainly tropical crops published by the Commonwealth Economic Committee and, like its predecessors, it is packed with invaluable information. The crops dealt with in it comprise sugar, tea, coffee, cocoa, spices, tobacco and rubber. The information given relates to 1952, together with data for the immediately preceding and also for the pre-war years; it includes data on production, acreages, imports, exports and prices both for the British Commonwealth and for the world as a whole.

The introductory section points out that the year 1952 marked a change in the trends both of supply and demand for many of the commodities dealt with, inasmuch for almost all of them the post-war expansion in production and trade was checked in 1952, for several commodities, including sugar, tea and rubber, prices fell below the high levels of 1950-51, while new factors have arisen with the derationing of tea and sugar in the United Kingdom.

Not all of these commodities show the same trends. Sugar production in 1952-53, though less than in the preceding season, was still 24% higher than before the war, a fact which governs the operation of the International Sugar Agreement now in force. Moreover, while market prices for some plantation crops, such as tea, fell during 1952 and there was some weakness for coffee, there were indications of a reversal of these trends last year. Moreover, the background for the recent rise in prices for coffee and cocoa is apparent in that for both these products overall supply has not exceeded pre-war figures, while unfavourable conditions affected the crops in 1953. Apart from foodstuffs, the trade in certain plantation crops, such as rubber and tobacco, is still to a large extent affected by Government measures of one kind or another; thus while natural rubber prices in the United States fell in 1953 to a point where they approximated to the price of the synthetic rubbers, it is noted that changes in United States policy may modify the demand for the two products. The incidence of policy measures has perhaps been even more marked in the case of tobacco because of restrictions on production in North America and the extent to which United Kingdom imports continue to be limited by dollar allocations; in 1952-53, for example, dollar allocations were less than one-quarter of the total for 1951-52.

The review makes evident the important part played by the British Commonwealth in the production of plantation crops. Its sugar production has continued to expand and under the Commonwealth Sugar Agreement is expected to rise still further, although there is still a large import balance for this commodity. Commonwealth countries supply the bulk of the tea and cocoa in world trade and a large part of the rubber, all of special importance as dollar earners. On the other hand, for tobacco and coffee the Commonwealth, as a whole, is on balance an importer, although in the latter case the expansion of output in Commonwealth countries during recent years has lessened dependence on imports.

Like all publications of the Commonwealth Economic Committee, the monograph is packed with information which is invaluable to all concerned with or interested in the production of plantation crops.

## Farm Mechanisation Directory, 1954

Pp. 612. Temple Press. 1953. 21s.

This is the edition for 1954 of the *Farm Mechanisation Directory*, the first of which was published for 1952. It is produced and compiled by 'Farm Mechanisation' and the present edition represents a considerable advance on its predecessor. It contains a complete list of all firms manufacturing agricultural machinery and equipment of every description, together with a considerable amount of useful information. It should form a valuable adjunct to the desks of farmers connected with the industry.

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## Hungary to Grow Pyrethrum

Large-scale growing of pyrethrum, has begun on the experimental farm of Akál, near Lake Balaton, in Hungary.

Stony and hitherto unproductive soil in the district of Udvar has been found suitable for cultivation of pyrethrum, previously grown in Hungary only as a garden flower.

# REPORTS AND PUBLICATIONS

## The Eighth Annual Report of the Committee for Colonial Agricultural, Animal Health and Forestry Research (1952-53)

This committee, of which the eighth annual report has recently been published, was established in 1945 for the purpose of co-ordinating agricultural, forestry and veterinary research throughout the Colonial dependencies. Since its inception its work has extended greatly, it has played its part in inaugurating many new lines of research, as well as in the establishment of a number of new research institutions designed to investigate problems connected with various crops in different parts of the Colonial tropics. It also maintains liaison with numerous research organisations in Great Britain, notably the Agricultural Research Council, thereby performing a noteworthy role in assisting the flow of knowledge and research from and to workers in the Colonies and those pursuing similar activities in the United Kingdom.

During the period under review visits to Colonial territories by members of the committee have continued to play an important part, Sir Frank Engledow, Sir William Slater, Prof. Beveridge and Dr. E. M. Crowther being among those who paid visits to East Africa. Mr. F. S. Collier, Forestry Adviser to the Colonial Office, visited the West Indies and Mr. R. J. Simmons, Veterinary Adviser to the Colonial Office, visited West and East Africa. Of the regional research organisations in the Colonies, the East African agricultural and veterinary research organisations continued to expand their work in a number of directions, notably in soil surveys under Mr. Gethin Jones, resulting in the mapping of some 450 additional square miles of territory; in soil microbiology, entomology and mycology on the agricultural side; and on East Coast fever, trypanosomiasis, rinderpest and systematics and life cycles of the paramphistome parasites of domestic ruminants, about which little is known, on the veterinary side.

In West Africa important events were the development of the Rice Research Station at Sierra Leone and the extension of the work of the Oil Palm Research Station at Benin, which has been transformed from a Nigerian to a West African institution.

The Cocoa Research Institute at Tafo continued work; *Cola chlamydantha* was shown to be among the most important intermediate hosts for swollen shoot viruses, the successful control of swollen shoot by regular inspection and cutting out continued to be demonstrated and investigations were continued of the various strains of swollen shoot virus.

The development of the 1,000-acre experimental station of the Agricultural Department of the University College of the Gold Coast was continued. It is expected that this project will facilitate the development of irrigational cultivation in the Accra Plains as a result of the erection of the projected dam on the River Volta.

In the West Indies good progress was continued with cocoa research at the Imperial College of Tropical Agriculture. Fertiliser trials with cocoa were inaugurated at Trinidad, Tobago and Grenada, the effects of various methods of restoring worn-out cocoa soils by tillage and manuring were investigated, causes of certain pathological conditions were also investigated and a cocoa collecting expedition in the upper tributaries of the Amazon and the Orinoco in the main and of South America was organised.

Banana research continued to be actively pursued in Jamaica at the new Banana Breeding Station despite difficulties.

Special lines of work on a large number of subjects and crops were begun or continued in many parts of the Colonies. Mention may be made of the inception of a survey of the cocoa soils of Nigeria by Dr. H. Vines, of the initiation of a programme of breeding work on sorghums in Northern Nigeria under the influence of Dr. O. J. Webster, of the University of Nebraska, seconded to Nigeria for a year under the E.C.A. scheme, and of various lines of research in animal husbandry and veterinary pathology in East and West Africa.

Altogether the report is evidence of ever-increasing activity in agricultural veterinary and forestry research throughout the British Colonial dependencies.

## Report of the Stored Products Working Party on the Protection of Foodstuffs in Store

This is the report of a working party appointed by the European Plant Protection Organisation (EPPO), which met under the direction of the Director of EPPO at the beginning of July, 1953 to consider the infestation and damage to foodstuffs by insects and mites. The working party did not discuss rodents, moulds or fungi.

The losses caused by this type of infestation are very serious. In 1947, for the world, they were estimated to be as high as 5%, and if the damage done by the rodent was included it would have been 10%. The working party agreed that as new techniques and methods of control were applied thoroughly most of this loss could be prevented. They passed a series of resolutions in this connection recommending that the appropriate authorities in each country should examine critically the measures taken within their territories for the prevention of losses to stored foodstuffs and to improve the work and methods of controlling pests. They discussed the possibility of drawing up a code of practice of hygiene measures and appropriate chemical treatments both on farms and in warehouses and agreed on certain basic principles. They also examined the question of infestation of grain during transit and made recommendations for the examination of cargoes in transit with a view to determining the number and kinds of insects present.

It is hoped that it will be possible to convene a further meeting of the working party this year.

The report contains a number of valuable appendices summarising the position in the various European countries that are members of the organisation.

## The Cawthron Institute Annual Report, 1952-53

The work of the Cawthron Institute is so well known both in New Zealand, where it is located, and in other countries of the world that it needs no general description. The position it holds in relation to research work in New Zealand is to an extent roughly parallel to that occupied by Long Ashton Research Station in this country. Much of its work is concerned with research in relation to fruit crops and market garden crops. The report for 1952-53 follows the customary lines. The plant nutrition investigations have, as in previous years, been devoted particularly to trace elements and have included work on manganese deficiency in raspberries, copper deficiency in tobacco, boron deficiency in raspberries and hops, magnesium in apples and hops.

Progress was made with investigations of verticillium wilt in hops and black root rot in hops. The steam and soil disinfectant treatment of glasshouse soils was used for tomato cultivation.

During the year the institute lost the services of Dr. Kathleen Curtis, who retired after 30 years' service as head of the Mycological Department, and Mr. R. T. J. Blick, Curator of the Museum. Sir Theodore Rigg continued to be director of the station and was re-appointed, by the Governor-General, chairman of the New Zealand Research Advisory Council of the Department of Scientific and Industrial Research for a further two years.

### The Agricultural History Review, Vol. 1, No. 1

That the growing importance agriculture is assuming in Great Britain is witnessed by the number of new publications of agricultural significance which are making their appearance in these days. The latest is the *Agricultural History Review*, which is published by the British Agricultural History Society, of which the first number has just appeared. The society itself is a newcomer and at present numbers only some 200 members, but it appears that there is hope that the number will shortly be increased considerably. The object of the society and the publication is to serve all interested in agriculture as a living and historical process and the intention is that each issue of the journal shall contain articles, together with short notes, comments, a bibliography and book reviews. The first number includes papers by Sir James Scott Watson on traditional farming beliefs in the light of modern science, Mr. N. W. Beresford on the census of sheep in 1549 and Mr. W. E. Minchinton on agriculture during the Napoleonic wars. These and other articles which appear in the magazine are all worthy of careful attention by the student and the general reader interested in agriculture, by whom they will be found to be extremely interesting.

We wish the society and the journal every success.

### 'Fruit,' a summary of figures of production and trade relating to fresh, canned and dried fruit, and wine. Price 5s. Obtainable from H.M. Stationery Office or Commonwealth Economic Committee.

Although the world trade in fresh fruit has not expanded to the same extent as production, it has fully recovered from the setback of the war years. The Commonwealth Economic Committee's annual review, 'Fruit,' shows that exports of the principal fruits rose from 5½ million tons in 1951 (which was slightly above pre-war) to 5¾ million tons in 1952.

Exports of nearly all the main kinds of fresh fruit entering international trade showed some increase in 1952, the only notable exception being apples, the 1951 exports of which were unusually heavy. World exports of oranges rose slightly to establish a new record at over 20% above pre-war, and there was a substantial increase in banana exports, which were easily the largest since the war.

Most countries in Western Europe had good apple crops in 1952 and this, coupled with a tightening of import restrictions, resulted in smaller purchases of apples from both neighbouring and overseas sources. Currency difficulties continued to retard the movement of apples to Europe from Canada and the United States. Apart from Canada, the trade of Commonwealth countries, all largely dependent on the United Kingdom market, was heavier; shipments from Australia were maintained at the previously fairly high level, New Zealand exports were doubled, and those of South Africa were half again as heavy as in 1951.

Orange crops were heavy in 1952 and the estimated world output of over 10 million tons was as much as 60% more than the 1934-38 average; production in the United States rose again to establish a new record and there were good crops in Mediterranean countries. Commonwealth production, on the other hand, was smaller owing to relatively poor crops in South Africa and Australia.

The decline in the banana trade of certain Central American and Caribbean countries has been offset by increased exports from South American and African sources. While Jamaican supplies were again fairly small in 1952, very considerable progress was made in rehabilitating plantations damaged by the hurricanes of the previous year and shipments by the end of 1952 had shown a remarkable recovery. Production in the British Cameroons, the other important Commonwealth source, also suffered from storm damage.

#### Supplies in the United Kingdom

Developments in production and trade have been accompanied by increasing fruit consumption in most countries. The United Kingdom, however, in spite of its larger domestic production, still continues to be a notable exception. Fresh fruit consumption in the United Kingdom in 1952 per head of the population was under 65 lb., which is nearly 14 lb., or about 17%, less than the 1934-38 average; the figure for 1951 was 69 lb. Home-grown crops in recent years have accounted for about half of the supplies; pre-war they represented less than a quarter. While quota restrictions (imposed because of balance of payments difficulties) reduced imports from foreign countries in 1952 by about one-third, there was some increase in supplies from the Commonwealth, which provided 60% of the total, as against under 40% in the previous year.

#### Canned fruit

Canned fruit output in the principal countries in 1952 was about 7% smaller than the record 1951. There was some reduction in the Canadian and South African packs, and also in the pineapple pack of Malaya. On the other hand, output in Australia established a new record and production was again heavy in the United Kingdom. International trade declined slightly, in spite of heavier shipments from Australia and the United States, and was only two-thirds of the 1938 level.

#### Dried fruit

Dried fruit production generally remained comparatively light in 1952, but there was a marked increase in the world output of dried raisins, due largely to heavier packs in the United States, the leading source, and Australia.

#### Wine

Wine production, which had been nearly up to pre-war in both 1950 and 1951, fell slightly in 1952, though it was larger than in other post-war years. Yields were somewhat heavier in France and Spain, but these increases were offset by declines in other countries. There was little change in the relatively small output of the two main Commonwealth wine-producing countries, Australia and South Africa, which produced twice as much as before the war.

### Farm and Horticultural Electrical Installations

The Council for Codes of Practice for Buildings has now issued in final form Code 325, 'Farm and Horticultural Electrical Installations.' It was drawn up by a committee convened on behalf of the Council by the Institution of Electrical Engineers and is a revision of the draft previously issued for comment.

The Code deals with the provision of electrical installations in and around farm buildings, nurseries, market gardens and private gardens and is applicable both to new installations and to the modernisation and extension of existing installations. It does not take the place of a detailed specification, and the assumption is made that the work is carried out under qualified supervision. The Code is thorough-going in its scope and incorporates a valuable body of detailed information on modern practice.

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### *Memphis Meeting*

'The Challenge of Surpluses' will be the topic for the 19th annual Chemurgic Conference to be held at the Hotel Peabody, Memphis, Tennessee, on April 5, 6 and 7. The conference is organised by the National Farm Chemurgic Council, Inc.

Speakers representing the viewpoints of agriculture, industry, science and government will address the group which was organised in 1935 to bring new farm and industrial income by seeking new industrial uses for farm crops.

# FARM MACHINERY

### The Platypus Bogmaster

Bog reclamation experts of the Irish Sugar Co. are stated to have been so impressed by Rotary Hoes' Platypus 30 'Bogmaster,' which underwent trials recently at Gowla Bog, Galway, that they placed their first order immediately. This success was the outcome of many months of research and investigation, which were carried out with the help of experts of the company and of the Bord na Mona (the official organisation responsible for bog reclamation). It is stated that this was the first occasion on which any manufacturer had made a special study of prime movers for bog work, although both the sugar company and the Bord na Mona had made very creditable adaptions on several types of tractor in an attempt to solve the problem.

Bog consists of live, decaying and dead fibrous matter with water and has a depth of from 8 ft. to 40 ft. The material in a bog can be compressed to one-twentieth its natural state by removing the water. Thus it will be seen that with such depth no possible support can be expected. It is the 'shear' strength of the fibres alone which supports either man or machine.

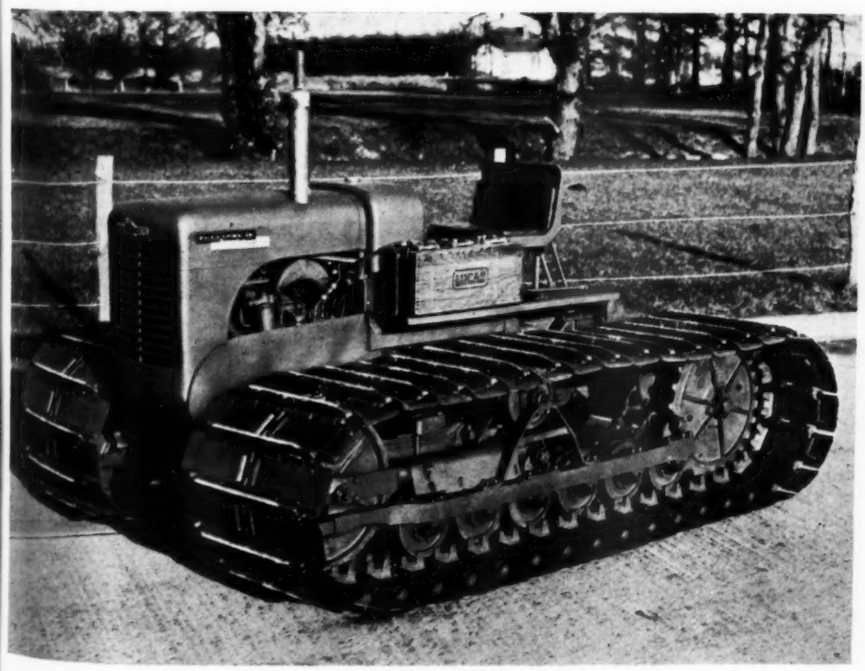
The problem, then, in designing a crawler tractor that could work under such conditions was one of distribution of weight and of providing tractive power over a virtually non-existent surface. The first Platypus 30 to be tested at Gowla was a wide-gauge model (46-in. track centres) with 24-in. track plates. The tests were carried out in the late autumn of last year and it was at once seen that a complete answer to bog work had still to be found.

Certain Platypus assemblies were redesigned to permit a much greater distribution of weight and give an extremely low ground pressure. The new design also took into account the fact that the tractor would be required to cross ditches on the bog without damaging the walls or causing collapse.

The outcome was the Platypus 30 'Bogmaster.' It has a Perkins diesel P.4 engine, 54-in. track centres, 32-in. track plates, with tracks extending to over 9 ft., and ground pressure of under 1.3. p.s.i.

The trials at Gowla included work on both dry and wet bog, including some bog so watery that it was impossible to walk upon the surface. Both sharp and gradual turns were demonstrated to show that the Platypus did not tear up the surface of dry bog and to show the turning radius. Ditches were crossed without breaking down the walls and without signs of trench collapse.

The Platypus 30 'Bogmaster' is expected to have wide applications, for a demand is anticipated from countries where rice is grown by the wet method or where swamps have to be reclaimed.



**The Platypus 30 'Bogmaster'**

### Cooper Pegler Catalogue

The 1954 catalogue of Cooper, Pegler and Co. Ltd., of Burgess Hill, Sussex, is now available from the company. The catalogue shows that several modifications have been made to existing machines and that there are certain additions to the range. Substantial reductions have also been made in the price of most of the machines.

Among the many machines and items of equipment described in the catalogue is the 'Leo-Colibri,' a special pressure-retaining pneumatic knapsack sprayer for use on fruit trees and bushes, tea, cotton, coffee, rubber, etc. This well-known model has been modified as a result of years of experience and is stated to be extremely efficient. A safety device is fitted.

The company states that it is able to show and demonstrate a wide range at Burgess Hill.

### Smoke Generator

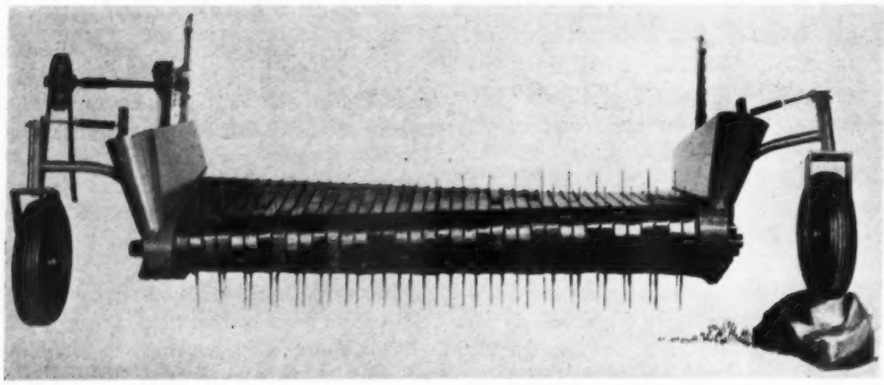
A pesticidal smoke generator for use against the tsetse fly in East and Central Africa is being developed for the Ministry of Supply and the Colonial Office by Tiltman Langley Laboratories Ltd., of Redhill, Surrey.

The generators are to be distributed from aircraft flying at about 400 ft. and will generate their pesticidal smoke at a predetermined time when atmospheric conditions are most favourable for complete coverage of the selected area.

Also associated in the production of the new smoke generator are I.C.I. Ltd., Lea Bridge Industries Ltd., The Metal Box Co. Ltd. and Smiths English Clocks Ltd.

The first unit (Mark I) consists of: (1) A sheet metal container with two compartments, one holding the burning mixture, the other containing the timing mechanism; (2) parasheet allowing the container to fall at approximately 50 ft. per second; (3) a sheet metal ring stowage for the parasheet; (4) a clockwork timing mechanism which can be set for any period of time up to 14 hours; and (5) an ignition device consisting of a percussion cap and quick match fuse set off by a striker released by the timing mechanism.

The canister is filled with 5 lb. of the burning mixture (benzyl hexachloride, DDT or a similar insecticide). The spring-loaded striker is pushed into the body of the timing mechanism and retained by the spring-release lever, which is in turn locked by the arming pin. The percussion cap, fuse and adaptor (supplied as a unit) are inserted into the barrel of the timing mechanism, being held by the screwed retaining cap.



**This 'Northwest Special' pick-up is being manufactured by the Innes Co., of Bettendorf, Iowa, U.S.A. As can be seen from the illustration, the machine equalises itself on irregular ground. It is stated the machine picks up every inch of the crop and that it has no difficulty with stones**

The timing mechanism is then set to a predetermined delay period by turning the graded ring to bring the required hour line opposite the knife edge of the spring-release lever. This mechanism is next inserted into the rolled thread in the canister. The cruciform lid is then screwed on and the timing pin inserted into the top of the timing piece to arrest the clock mechanism.

The parachute is placed in the ring stowage and the static line attached. This unit is then attached to the canister with three spring clips and the free loop of the arming pin cord is hooked around the arming pin.

For large-scale distribution the canisters would be carried on racks fitted into an aircraft and fed manually on to a conveyor belt feeding to a hole in the floor of the aircraft on the fore and aft centre line. The timing mechanism would be set and the pins removed prior to taking off. The canisters would be dropped from about 400 ft. with the aircraft flying at 120 to 200 m.p.h. In this way approximately 1,285 canisters could be distributed over 12 square miles of territory in one and a quarter hours. This 'bombing pattern' could, however, be varied to suit local conditions.

### *New Massey-Harris Tractor*

A new Massey-Harris tractor is now in production at Kilmarnock for home and export markets. The new 745 tractor is a development of the 744D, but is fitted with a four-cylinder Perkins L.4 diesel engine rated to develop 44.6 b.h.p. at 1,500 r.p.m. The 745, however, is said to have more power and a lower fuel consumption than the earlier tractor.

The L.4 engine has a maximum torque of 170-5 lb./ft. at 980 r.p.m. It is designed for easy maintenance and has wet, replaceable cylinder liners. The L.4 incorporates the patented Perkins 'Aeroflow' combustion system and is fitted with 'Ki-gas' starting equipment to facilitate starting in very cold weather.

The engine is connected by a flexible coupling to the transmission and sump and clutch can be removed without lifting the engine or splitting the tractor. There are five forward and one reverse gears. The transmission is simply constructed with straight spur gears and speed reduction is obtained in three stages. The gearbox input and countershafts run on taper roller bearings in place of straight bearings used in 744D transmission.

There is a choice of rear wheel equipment for 13 by 30, 14 by 30 or 12 by 38 tyres. The rear axle with 12 by 38 tyres is adjustable from 54-84 in. track in 2-in. steps, and 54, 60, 62, 64, 66, 72, 74, 76 and 78 for 13 by 30 and 14 by 30 tyres. There are three types of front axle: standard, hi-arch, rowcrop and pedestal rowcrop. The hi-arch front axle is adjustable to give a track 54 to 74 in. in 4-in. steps. The standard front axle (normal track 54 in.) can also be supplied with variable track wheels. Optional equipment includes lights, hour meter, belt pulley and hydraulic lift.

Designed for use with all British Standard Category 2 implements. Implements can be raised or lowered at two speeds or held in any position. The sump is driven off the engine, and therefore the lift is independent of clutch control. For use with front-, rear- or mid-mounted implements. Tapping point for 'slave' rams enables trailed implements to be hydraulically controlled.

Massey-Harris hydraulic lift and three-point linkage equipment is said to incorporate the best features from both sides of the Atlantic.

The hydraulic equipment consists of:

(1) A lift unit incorporating the oil reservoir selector valve, ram and lift shaft which bolts on to the top of the transmission.

(2) A gear type pump, together with its drive coupling and mounting located on the front of the engine crankshaft and coupled to the lift unit by two pipes.

(3) A three-point linkage to British Standard Category 2 for connecting implements to tractor. Any implement built to No. 2 British Standard can be used with the three-point hitch.

**The new Massey-Harris No. 745 tractor**

# WORLD CROP REPORTS

## WORLD

**Soya bean production.** World production of soya beans in 1953 is expected to have been slightly less than in 1952, according to a forecast of the U.S. Foreign Agricultural Service. Present prospects are for a harvest of 654.5 million bushels, compared with the 1952 revised estimate of 667.7 million bushels and the record outturn of 669.4 million bushels produced in 1950.

The expected decline from 1952 of over 13 million bushels in world production is essentially the difference between the sharp drop in United States production and the sizable increases foreseen in China and Manchuria. United States production represents 86% to 88% of the soya beans grown in the areas of the free world, while production in the free world accounts for about one-half of the world total.

As of November 1, the United States harvest was placed at 252.3 million bushels or 14% below the 291.7 million bushels produced in 1952 and the smallest crop since 1949. Harvested area at 14.3 million acres was the largest of record, but the average yield of 17.6 bushels was the lowest since 1947. Dry summer and fall weather seriously damaged the soya bean crop over much of the main producing area. Final yields were lower than expected earlier in some areas due largely to extremely small beans in the pods, low moisture content of beans and shattering, which caused heavy harvesting losses.

Canadian production set a new record for the tenth successive year. The crop, all in Ontario Province, was up 7% from 1952 and was over 21 times the average pre-war volume. Acreage was one-fourth larger than the previous year, but the average yield declined to 20.4 bushels against 24.0 a year ago.

There is believed to have been considerable improvement in China's soya bean output last year. In China proper, production is estimated roughly at 220 million bushels or 10% above the estimated harvest of 1952. This size crop, moreover, would indicate an increase from the pre-war level—possibly for the first time. Manchuria's crop may have approximated 134 million bushels or around 7% above the 1952 estimate. On the basis of this estimate Manchuria output has not regained the pre-war level. Acreage in soya beans probably was expanded this year in all China. Edible oils for local consumption reportedly are in short supply in parts of China.

Following a high level of expansion in soya bean production in recent years, Japan's 1953 harvest dropped around 18% as a result of unfavourable weather.

Brazil's soya bean harvest increased by about 8% last year. Over 98% of the crop is concentrated in Rio Grande do Sul, but production is expanding in Sao Paulo and other South Brazilian states. A slightly larger area is planted for harvest in 1954 because of good export prospects.

Soya bean production in Africa is relatively unimportant. On the basis of production in recent years, Nigeria probably produced around 140,000 bushels for export and output in the Union of South Africa likely was around 100,000 bushels.

**Tobacco production.** Production in North America for 1953 is estimated at 2,441 million lb., down about 200 million from 1952 and slightly below the 1947-51 annual average. This is due primarily to smaller acreage and lower average yield in the United States. There were increases in Mexico and Central American countries. Due primarily to the favourable price and general demand situation for cigar leaf, production of this kind of tobacco in 1953 was stimulated in tobacco-producing islands of the Carribean area (particularly Cuba, Dominican Republic and Puerto Rico).

Estimated 1953 production at 435.8 million lb. for South America establishes a new high record. This is about 6.8% above 1952 and 15% greater than the annual average during the 1947-51 period. Nearly all the increase over 1952 is due to larger production in Brazil and Argentina. This was brought about chiefly through expanded acreages and higher yields in important flue-cured producing areas in southern Brazil and improved yields in Argentina. Production of Bahia cigar in northern Brazil was far below normal due to severe drought conditions during the December 1952-March 1953 period.

European production in 1953 is estimated at 1,237 million lb. compared to 1,102 million in 1952. Production for the U.S.S.R. was estimated at 450 million lb. in both 1952 and 1953, although little is known about the exact levels of output. Increases in 1953 relative to 1952 were especially pronounced in Greece, Yugoslavia, Bulgaria and Hungary. Higher levels of production in 1953 were general throughout South-Eastern Europe, where severe drought conditions prevailed in 1952. Significant increases were also reported for France, Germany and Spain.

Total 1953 production in Asia (excluding Manchuria) is estimated at 2,923 million lb. or about 4.4% above 1952, but still slightly below the annual average during the 1947-51 period.

Acreages and production in Turkey, Iran, India and Japan were up substantially from 1952 levels. Combined production of India and Pakistan is still below the level reported in the 1935-39 period, but much of this may be due to the differences in methods of estimating production. While little is known in regard to China, the most important tobacco-producing country in Asia, it is reported that tobacco yields are again, as in 1952, below normal due to unfavourable weather.

The estimated production in Africa for 1953 is 274.7 million lb. Output was 267.7 million lb. in 1952, compared with annual averages of 235.5 million for 1947-51 and 126.9 million during 1935-39. These data indicate the continuation of a steep upward trend in that area. The upward trend in Southern Rhodesia, Northern Rhodesia and Nyasaland continue to dominate developments in Africa. The Union of South Africa was the only major tobacco-producing country in Africa to show a decline in 1953 as compared to 1952, when output was abnormally high.

The estimated output of Oceania for 1953 is 11.6 million lb., a decline of 1.9 million compared to 1952. This is due primarily to the lower average yields in Australia.

The continuing upward trend in the southern part of Africa (primarily Southern Rhodesia, Northern Rhodesia, Nyasaland and Union of South Africa), in Southern Brazil, Argentina, Canada, Cuba, Dominican Republic, Greece and Turkey and the recent decline in cigar leaf output of Indonesia, as compared to the pre-independence period, appear to be the outstanding recent developments in so far as shifting patterns of production for export are concerned.

The recent increases in production to fulfil domestic needs is particularly important in various Western European countries (especially Italy, France and Spain) as well as in Argentina, Canada, Japan, Taiwan (Formosa) and Thailand.

At the same time that these developments materialise total United States production has increased greatly, but there has been a major shift in pattern in so far as proportion of production for export is concerned. The percentage of total production exported has declined, particularly as the various African countries indicated above have increased shipments to the United Kingdom as well as to other Western European countries.

(*Foreign Crops and Markets.*)

### INDIA

**Jute.** The all-India final estimate of jute for 1953-54 puts the area and production at 1,196,000 acres and 3,123,000 bales (of 400 lb. each) respectively, as against the partially revised estimate for the previous year of 1,817,000 acres and 4,605,000 bales, thereby showing a decrease of 621,000 acres or 34.2% in area and 1,477,000 bales or 32.1% in production, according to the Ministry of Food and Agriculture, Government of India.

The decline in acreage and production of jute has been reported by all the jute-growing states; it is, however, more marked in West Bengal and Bihar and is due mainly to unfavourable weather conditions and low prices of jute at the time of sowing. In parts of West Bengal and U.P. the crop also suffered to some extent from floods and attacks of semilooper caterpillars.

### U.S.A.

**Cotton.** For 1953 a cotton crop of 16,437,000 bales is estimated by the United States Crop Reporting Board. This compares with the 1952 crop of 15,139,000 bales and the 10-year average of 12,216,000 bales. The indicated 1953 production is the fourth largest on record.

The acreage of cotton in cultivation on July 1 is now estimated at 25,376,000 acres and compares with the revised 1952 estimate of 27,100,000 acres and the revised 1942-51 average of 22,036,000 acres. Abandonment of cotton in cultivation on July 1 is estimated at 3.7%, leaving 24,434,000 acres for harvest, compared with the revised 1952 estimate of 25,841,000 acres and the revised 10-year average of 21,489,000.

The average lint yield per acre of 322.4 lb. is 11.1 lb. above the previous record high yield of 311.3 lb. harvested in 1948 and compares with the revised 10-year average of 271.4 lb. The record yield per acre is largely due to an increase in the proportion of the acreage in the higher yielding states. Louisiana was the only state which has a record high yield. Yields were generally less than average in most eastern states and above average in central and western states.

Picking and ginning made good progress during November under favourable weather conditions in all states except Texas, Oklahoma and California. East of the Mississippi River and in Missouri and Louisiana, each state reported more than 95% of the crop ginned by December 1 with ginning practically completed in several of these states. In Arkansas ginning was 93% completed by December 1, which is slightly less than last year, but higher than average. Ideal harvesting weather prevailed during November in Arizona and ginning was much farther advanced than usual. Wet weather delayed harvesting in Texas and Oklahoma during early November and progress was somewhat retarded. However, stripping was moving forward rapidly in late November. In Texas approximately 82% of the crop was ginned by December 1, well under the 10-year average of 89%. In California picking and ginning made rapid progress during the first half of November, but general rains in the San Joaquin Valley on November 14 and foggy weather since that date have retarded harvesting. For the United States approximately 88% of the crop had been ginned by December 1, compared with 89.8% a year ago and the 10-year average of 88.1%.

The forecast of 16,437,000 bales of 500 lb. gross weight is equivalent to 16,272,000 running bales, based on estimated bale weights, by states for the 1953 crop. The Bureau of the Census reports 14,323,045 running bales were ginned from the crop of 1953 prior to December 1, compared with 13,420,073 bales for 1952 and 12,804,430 bales for 1951.

If the ratio of lint to cottonseed is the same as the average for the past five years, cottonseed production would be 6,718,000 tons. This compares with 6,190,000 tons in 1952.

(*Cargill Crop Bulletin.*)

### LEBANON

**Vegetable oils.** Lebanon's production of olive oil in 1953 is estimated at about 11,000 short tons, substantially above the preceding year. Using 5% acidity as the dividing line between edible and inedible oil, it is estimated that 9,000 tons could be classed as edible. Olive oil exports during January-September 1953 of 998 tons were 56% above 1952 figures, largely because domestic demand shifted from the more expensive olive oil to cottonseed oil, leaving more available for export.

Cottonseed production declined due to the shifting to other crops of land formerly planted to cotton. However, large imports of cottonseed from Syria (25,426 tons in January-September 1953) at reduced prices, plus substantial stocks carried over from 1952, resulted in a record cottonseed oil output of 4,960 tons. Because of increased local supply, no cottonseed oil was imported in 1953; exports, which totalled over 2,200 tons for the first nine months of 1953, may exceed last year's total of 2,458 tons by the end of the year. As cottonseed oil was substituted for olive oil by local consumers, the price of the latter declined.

As usual, locally produced sesame seed fulfilled less than half of the country's requirements for tihini (sesame paste). Paste production in 1953 totalled 1,500 tons, about the same as in 1952. Imports of sesame seed, however, of some 2,200 tons represented a substantial increase from the preceding year.

Peanut production remained unchanged, totalling about 660 tons for the year. Most of the nuts are consumed locally as salted peanuts. The output of coconut oil, produced from imported copra, was about the same as in 1952 or 1,100 tons. Copra imports declined markedly, but large stocks were carried over from the previous year.

Since the organisation of a vegetable oil syndicate in October 1953 oil prices, particularly of cottonseed oil, have improved. Before the organisation of this syndicate prices of oil dropped sharply as a result of large quantities of cottonseed and olives being offered for sale. Vegetable oil producers report that the new association will attempt to control local production, so that Lebanese oils can compete more effectively in foreign markets.

### PHILIPPINES

**Abaca production.** Abaca production in the Philippines in 1953 may be 3% to 6% below that in 1952. Production in the first two quarters of 1953 was slightly above that in the comparable quarters of the preceding year, but the third quarter showed a decrease of 3%. The fourth quarter was expected to show an even greater decrease. Continued lower production is expected throughout the current year.

Abaca production decreased in the second and third quarters of 1953 in Southern Luzon and the Leyte and Samar area, but the nine-month total showed increases of 12% and 5% respectively over the corresponding nine months of 1952. In Southern Mindanao the increase in the second quarter of 1953 was followed by a decrease in the third quarter, leaving the total for the nine months at 8% below the corresponding total in 1952.

Total production for January-September 1953 was 187.7 million lb., or less than 1% below the total for January-September 1952. The outlook for abaca harvesting is not too encouraging for the next few years. North of Davao City, except in the more recently settled areas, mosaic disease has gained some headway in the face of Government efforts aimed at halting its advance. The disease does exist, however, in the newly planted areas and it is feared that it will soon spread to each new area after the plantings have been made. Control work will be carried on with a considerably smaller working group after 1953.